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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

MELODY AND THE ORIGIN OF THE MUSICAL SCALE[1]

IN the vice-presidential addresses of the American Association great latitude in the choice of subjects is allowed and taken, but there is, I believe, no precedent for choosing the review of a book, printed fifty-five years before. Helmholtz's Tonenempfindungen, produced by a masterful knowledge of physiology, physics and mathematics, and a scholar's knowledge of the literature of music, has warded off all essential criticism by its remarkable breadth, completeness and wealth of detail. Since it was first published it has been added to by the author from time to time in successive editions, and greatly bulwarked by the scholarly notes and appendices of its translator, Dr. Alexander J. Ellis. The original text remains unchanged and unchallenged on physical grounds. In taking exception at this late day to the fundamental thesis of Part III., I derive the necessary courage from the fact that should such exception be sustained, it will serve to restore to its full application that greater and more original contribution of Helmholtz which he included in Part II. Having given a physical and physiological explanation of the harmony and discord of simultaneous sounds, and therefore an explanation of the musical scale as used in modern com-

[1] Address of the vice-president and chairman of Section B—Physics—American Association for the Advancement of Science, Chicago, 1907–8.

position, Helmholtz was met by an apparent anachronism. The musical scale, identical with the modern musical scale in all essentials, antedated by its use in single part melody the invention of chordal composition, or, as Helmholtz expressed it, preceded all experience of musical harmony. In seeking an explanation of this early invention of the musical scale Helmholtz abandoned his most notable contribution, and relegated his explanation of harmony and discord to the minor service of explaining a fortunate, though, of course, an important use of an already invented system of musical notes. The explanation of the original invention of the musical scale and its use in single-part music through the classical and the early Christian eras, he sought for in purely esthetic considerations—in exactly those devices from which he had just succeeded in rescuing the explanation of harmony and discord.

The human ear consists of three parts—in the nomenclature of anatomy—of the outer, middle and inner ear. The outer and inner ears are connected by a series of three small bones traversing the middle ear and transmitting the vibrations of sound. The inner ear is a peculiarly shaped cavity in one of the hard bones of the skull. That part of the cavity with which we are here concerned is a long spiral passage called from its resemblance to the interior of a snail shell, the cochlea. The cavity has two windows which are closed by membranes. It is to the uppermost of these membranes that the train of three small bones reaching from the drum of the outer ear is attached at its inner end. It is to this upper membrane, therefore, that the vibration is communicated, and through it the vibration reaches the fluid which fills the inner cavity. As the membrane covering the upper window vibrates, the membrane covering the lower window yielding also vibrates, and the motion of the fluid is in the nature of a slight displacement from one to the other window, to and fro. From between these windows a diaphragm, dividing the passageway, extends almost the whole length of the cochlea. This diaphragm is composed in part of a great number of very fine fibers stretched side by side, transverse to the cochlea, and called after their discoverer, fibers of Corti. On this diaphragm terminate the component fibers of the auditory nerve. When the liquid vibrates the fibers vibrate in unison, the nerve terminals are stimulated, and thus the sensation of sound is produced. These fibers of Corti are of different lengths and presumably are stretched with different tensions. They therefore have different natural rates of vibration and a sympathetic resonance for different notes. The whole has been called a harp of several thousand strings.

Were these fibers of Corti very free in their vibration, each would respond to and would respond strongly only to that particular note with whose frequency it is in unison. Because of the fact that they are in a liquid, and possibly also because of the manner of their terminal connections, they are considerably damped. Because of this their response is both less in amount and less selective in character. In fact, under these conditions not one, but many fibers vibrate in response to a single pure note. A considerable length or area of the diaphragm is excited. So long as the exciting sound remains pure in quality, constant in pitch and constant in intensity, the area of the diaphragm affected and the amplitude of its vibration remain unchanged. If, however, two notes are sounded of nearly the same pitch, the areas of the diaphragm affected by the two notes overlap. In the overlapping region the vibration is violent when the two notes are in the same phase, weak when they are

in opposite phase. The result is the familiar phenomenon of beats. Such beats when slow are not disagreeable and not without musical value. If the difference between the two notes is increased the beats become more rapid and more disagreeable. To this violent disturbance, to the starting and stopping of the vibration of the fibers of Corti, Helmholtz ascribed the sense of roughness which we call discord. As the notes are more widely separated in pitch the overlapping of the affected areas diminishes. Between pure notes the sense of discord disappears with sufficient separation in pitch. When the two vibrating areas exactly match because the two notes are of exactly the same pitch, and when the two areas do not in the least overlap because of a sufficiently wide separation in pitch, the result, according to Helmholtz, is harmony. Partial overlapping of the affected areas produces beats, and the roughness of beats is discord. Such, reduced to its fewest elements, is Helmholtz's explanation of the harmony and discord of tones which are pure notes.

But no musical tone is a pure note. A musical tone always consists of a combination of so-called partial tones which bear to each other a more or less simple relationship. Of these partial tones, one is called the fundamental—so called because it is the loudest or lowest or, better still, because it is that to which the other partial tones bear the simplest relation. A musical tone, therefore, affects not one, but, through its fundamental and upper partial tones, several areas of the diaphragm in the cochlea. Two musical tones, each with its fundamental and upper partials, therefore affect areas of the diaphragm which overlap each other in a more or less complicated manner, depending on the relative frequencies of the fundamental tones and the relationships of their upper partials. The exact matching of the areas affected by these two systems of partial tones, or the entire separation of the affected areas, gives harmony. The overlapping of these affected areas, if great, produces discord, or if slight in amount, modifications and color of harmony.

In the great majority of musical tones the upper partials bear simpler relationships to the fundamentals, being integral multiples in vibration frequency. Helmholtz showed that if of two such tones one continued to sound unchanged in pitch, and the other, starting in unison, was gradually raised in pitch, the resulting discord would pass through maxima and minima, and that the minima would locate the notes of the pentatonic scale. The intermediate notes of the complete modern musical scale are determined by a repetition of this process, starting from the notes thus determined.

If to this is added a similar consideration of the mutual interference of the combinational tones which are themselves due to the interaction of the partial tones, we have the whole, though, of course, in the briefest outline, of Helmholtz's theory of the harmony and discord of simultaneously sounding musical tones.

Having thus in parts I. and II. developed a theory for the harmony and discord of simultaneous sounds, and having developed a theory which explains the modern use of the musical scale in chords and harmonic music, Helmholtz pointed out in part III. that the musical scale in its present form existed before the invention of harmonic music and before the use of chords. Music may be divided into three principal periods:

1. "Homophonic or unison music of the ancients," including the music of the Christian era up to the eleventh century, "to which also belongs the existing music of Oriental and Asiatic nations."

2. "Polyphonic music of the middle

ages, with several parts, but without regard to any independent musical significance of the harmonies, extending from the tenth to the seventeenth century."

3. "Harmonic or modern music characterized by the independent significance attributed to the harmonies as such."

Polyphonic music was the first to call for the production of simultaneous sounds and therefore for the hearing or the experience of musical harmony. Homophonic music, that which alone existed up to the tenth or eleventh century, consisted in the progression of single-part melody. Struck by this fact, Helmholtz recognized the necessity of seeking another explanation for the invention and the use of a scale of fixed notes in the music of this period. To borrow his own words, "scales existed long before there was any knowledge or experience of harmony." Again, elsewhere he says in emphasizing the point: "The individual parts of melody reach the ear in succession. We can not perceive them all at once; we can not observe backwards and forwards at pleasure." Between sounds produced and heard in discrete succession, there can be neither harmony nor discord, there can not be beats, or roughness or interruption of continuous vibrations. Regarding the sounds of a melody as not merely written in strict and non-overlapping succession, but also as produced and heard in discrete succession, Helmholtz sought another basis for the choice of the notes to constitute a scale for homophonic music. His explanation of this invention can be best presented by a few quotations:

> Melody has to express a motion, in such a manner that the hearer may easily, clearly and certainly appreciate the character of that motion by immediate perception. This is only possible when the steps of this motion, their rapidity and their amount, are also exactly measurable by immediate sensible perception. Melodic motion is change of pitch in time. To measure it perfectly, the length of time elapsed, and the distance between the pitches, must be measurable. This is possible for immediate audition only on condition that the alterations in both time and pitch should proceed by regular and determinate degrees.

Again Helmholtz says:

> For a clear and sure measurement of the change of pitch, no means was left but progression by determinate degrees. This series of degrees is laid down in the musical scale. When the wind howls and its pitch rises or falls in insensible gradations without any break, we have nothing to measure the variations of pitch, nothing by which we can compare the later with the earlier sounds, and comprehend the extent of the change. The whole phenomenon produces a confused, unpleasant impression. The musical scale is as it were the divided rod, by which we measure progression in pitch, as rhythm measures progression in time. Hence the theoreticians of ancient as well as modern times.

Later he says:

> Let us begin with the octave, in which the relationship to the fundamental tone is most remarkable. Let any melody be executed on any instrument which has a good musical quality of tone, such as a human voice; the hearer must have heard not only the primes of the compound tones, but also their upper octaves, and, less strongly, the remaining upper partials. When, then, a higher voice afterwards executes the same melody an octave higher, we hear again a part of what we heard before, namely, the evenly numbered partial tones of the former compound tones, and at the same time we hear nothing that we had not previously heard.
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> What is true of the octave is true in a less degree for the twelfth. If a melody is repeated in the twelfth we again hear only what we had already heard, but the repeated part of what we heard is much weaker, because only the third, sixth, ninth, etc., partial tone is repeated, whereas for repetition in the octave, instead of the third partial, the much stronger eighth and tenth occur, etc.
>
> For the repetition in the fifth, only a part of the new sound is identical with a part of what had been heard, but it is, nevertheless, the most perfect repetition which can be executed at a smaller interval than an octave.

Without carrying these quotations farther, they will suffice to illustrate the basis which Helmholtz would ascribe to

homophonic music and early melodic composition. On this explanation the basis of melody is purely that of rhythm and rhythm based on a scale of intervals. The scale of intervals in turn is based on a recognition conscious or subconscious of the compound character of musical tones and of the existence in tones of different pitch of partials of the same pitch. This calls for a degree of musical insight and discrimination which it is difficult to credit to a primitive art. It is in reality the skill of the highly trained musician, of a musician trained by long experience with sounds which are rich and accurate in quality. This power of analysis goes with supreme skill rather than with the early gropings of an art.

After having developed a theory of harmony and discord based on elaborate experimental and mathematical investigations, which was remarkable in bringing together three such diverse fields as physics, physiology and esthetics, he relegated it to the minor application of explaining the use in modern music of an already existing and highly developed musical scale, and sought an explanation of the earlier use of the scale in melody and its original invention in a principle which is very far from possessing either the beauty or the convincing quality of his earlier hypothesis. He was forced to this by the priority of melodic or homophonic composition. He saw in melody only a succession of notes, no two existing at the same time, and therefore incapable of producing harmony or discord in a manner such as he had been considering.

It is true that melody is written as a pure succession of discrete notes, one beginning only when the other has ceased. It is true also that melody is so sung and so produced on a homophonic instrument such as the voice, flute, reeds or on stringed instruments. This is peculiarly true of the voice, and it is with the voice that one naturally associates the earliest invention of the scale. But while it is true that the earliest song must have consisted of tones produced only in succession, it is not necessarily true that such sounds were heard as isolated notes. A sound produced in a space which is in any way confined continues until it is diminished by transmission through openings, or is absorbed by the retaining walls or contained material to such a point that it is past the threshold of audibility, and this prolongation of audibility of sound is under many conditions a factor of no inconsiderable importance. In many rooms of ordinary construction the prolongation of audibility amounts to two or three seconds and it is not exceedingly rare that a sound of moderate initial intensity should continue audible for eight, nine, or even ten seconds after the source has ceased. As a result of this, single-part music produced as successive separate sounds is nevertheless heard as overlapping, and at times as greatly overlapping tones. Each note may well be audible with appreciable intensity not merely through the next note, but through several succeeding notes. Under such conditions we have every opportunity even with single-part music for the production of all the phenomena of harmony and discord which have been discussed by Helmholtz in explanation of the chordal use of the musical scale. In any ordinarily bare and uncarpeted room, one may sing in succession a series of notes and then hear for some time afterward their full chordal effect.

All the arguments that Helmholtz advanced in support of his hypothesis that the musical scale was devised solely from considerations of rhythm and founded on a repetition of faint upper partials, hold with equal force in the explanation here proposed. The identity of partial tones in

compound tones with different fundamentals is one of the conditions of harmony, and the scale devised by considerations of the mutual harmony of the notes sounded simultaneously would, in every respect, be the same as that of a scale based on repeated upper partials. In the one case the identity of upper partials is an act of memory; in the other it is determined by the harmony of sustained tones. All the arguments by Helmholtz based on historical considerations and on racial and national differences are equally applicable to the hypothesis of sustained tones. In fact, they take on an additional significance, for we may now view all these differences not merely in the light of differences in racial development and temperament, but in the light of physical environment. Housed or unhoused, dwelling in reed huts or in tents, in houses of wood or of stone, in houses and temples high vaulted or low roofed, of heavy furnishing or light, in these conditions we may look for the factors which determine the development of a musical scale in any race, which determine the rapidity of the growth of the scale, its richness and its considerable use in single-part melody.

The duration of audibility of a sound depends on its initial intensity and on its pitch, to a small degree on the shape of the confined space, and to a very large degree on the volume of the space and on the material of which the walls are composed. The duration of audibility is only a logarithmic function of the initial intensity, and as the latter is practically always a large multiple of the minimum audible intensity, this feature of the problem may be neglected when considering it broadly. For this discussion we may also leave out of consideration the effect of shape as being both minor and too intricately variable. The pitch here considered will be the middle of the musical scale; for the extremes of the scale the figures would be very different. The problem then may be reduced to two factors, volume and material. It is easy to dispose of the problem reduced to these two elements.

The duration of audibility of a sound is directly proportional to the volume of a room and inversely proportional to the total absorbing power of the walls and the contained material. The volume of the room, the shape remaining the same, is proportional to the tube, while the area of the walls is proportional to the square of the linear dimensions. The duration of audibility, proportional to the ratio of these two, is proportional itself to the first power of the linear dimension. Other things being equal, the duration of audiblity, the overlapping of successive sounds, and therefore the experience of harmony in single-part music, are proportional to the linear dimensions of the room, be it dwelling-house or temple.

Turning to the question of material, the following figures are suggestive: Any opening into the outside space, provided that outside space is itself unconfined, may be regarded as being totally absorbing. The absorbing power of one-half-inch hard pine-wood sheathing is 6.1 per cent., of plaster on wood lath 3.4 per cent., of single-thickness glass 2.7 per cent., of brick in Portland cement 2.5 per cent., of the same brick painted with oil paint 1.4 per cent. Of the others wood sheathing is nearly double any of the rest. On the other hand, a man in the ordinary clothing of to-day is equal in his absorbing power to nearly 48 per cent. of that of a square meter of unobstructed opening, a woman is 54 per cent., and a square meter of audience at ordinary seating distance is nearly 96 per cent. Of significance also in this connection is the fact that Oriental rugs have an absorbing power of nearly 29 per cent. and house plants of 11 per cent.

Of course, the direct application of these figures in any accurate calculation of the conditions of life among different races or at different periods of time is impossible, but they indicate in no uncertain manner the great differences acoustically in the environment of Asiatic races, of aboriginal races in central and southern Africa, of the Mediterranean countries, of northern Europe at different periods of time. We have explained for us by these figures why the musical scale has but slowly developed in the greater part of Asia and of Africa. Almost no traveler has reported a musical scale, even of the most primitive sort, among any of the previously unvisited tribes of Africa. This fact could not be ascribed to racial inaptitude. If melody was, as Helmholtz suggested, but rhythm in time and in pitch, the musical scale should have been developed in Africa if anywhere. These races were given to the most rhythmical dancing and the rhythmical beating of drums and tom-toms. Rhythm in time they certainly had. Moreover, failure to develop a musical scale could not be ascribed to racial inaptitude to feeling for pitch. Transported to America and brought in contact with the musical scale, the negro became immediately the most musical part of our population. The absence of a highly developed scale in Africa must then be ascribed to environment.

Turning to Europe, we find the musical scale most rapidly developing among the stone-dwelling people along the shores of the Mediterranean. The development of the scale and its increased use kept pace with the increased size of the dwellings and temples. It showed above all in their religious worship as their temples and churches reached cathedral size. The reverberation which accompanied the lofty and magnificent architecture increased until even the spoken service became intoned in the Gregorian chant. It is not going beyond the bounds of reason to say that in those churches in Europe which are housed in magnificent cathedrals the Catholic, the Lutheran and Protestant Episcopal, the form of worship is in part determined by their acoustical conditions.

This presents a tempting opportunity to enlarge on the fact that the alleged earliest evidence of a musical scale, a supposed flute, belonged to the cave-dwellers of Europe. This and the impulse to sing in an empty room, and the ease with which even the unmusical can keep the key in simple airs under such conditions, are significant facts, but gain nothing by amplification. The same may be said of the fact that since music has been written for more crowded auditoriums and with harmonic accompaniment the air has become of less harmonious sequence. These and many other instances of the effect of reverberation come to mind.

In conclusion, it may be not out of place to repeat the thesis that we would not merely with Helmholtz regard melody as rhythm in time and rhythm in pitch, but also as harmony in sustained tones, and see in the history of music, certainly in its early beginnings, but possibly also in its subsequent development, not only genius and invention, but also the effect of physical environment.

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THE RELATION OF INSTINCT TO INTELLIGENCE IN BIRDS

IN the following observations an attempt is made to analyze the behavior of the wild bird in order to ascertain first, how their instincts are modified by their ability to learn, and secondly the degree of intelligence which they ordinarily attain. It may be taken as an axiom that if the bird be intelligent, it must use its intelligence in meeting the emergencies of daily life

and the dangers which surround its home. I shall refer mainly to nesting birds. In all cases the conditions are natural and the behavior free.

In considering the young we must distinguish between the altricious and precocious species, and remember that between such extremes every shade of difference exists. The cedar waxwing which is born blind and naked may be taken as a type of the altricious group. The moment it bursts its shell, unfolds and dries off, a new class of stimuli assail it. Its sensitive skin, with its tactile organs and ears, begin to register new emotions. Its most striking initial reaction is to rise upon its pot-belly as upon a central pillar or foot, open its wide mouth, and thus display its light-rimmed scarlet "target" of a throat. This reaction might arise from hunger, but it certainly follows mechanically in response to any sound or vibration to the nest. At birth such a nestling is a nearly perfect reaction machine; its responses are automatic and reflex, and within the limits of fatigue they are as uniform and continuous as the responses of an electric bell. At this sign from the young the parent goes in quest of prey, discovers and seizes it, hammers it to a pulp, it may be, and returns with it to the nest. The nestling repeats the sign, and the food is pressed gently down into its sensitive throat; the swallowing reflex is started, and the little bird gets its first meal. Remove this bird from its nest, and this feeding response is given as regularly and as continuously as before. Now approach the same nest upon the second, or better, upon the third or fourth day and apply the same tests. It will be found that the feeding reaction no longer comes uniformly and invariably, and if the young is again removed from its nest, the response is still more difficult to obtain. The characteristic feeding reaction is now regular and predictable only in the presence of the parent, and in its proper environment—the nest. Therefore in forty-eight hours the young cedarbird begins to show the first sign of intelligence by learning to limit its reactions to those which count, or in other words by learning to recognize the coming of the parent. Yet this association, which seems to mark the dawn of avian intelligence, is often far from precise, for when at the age of eight or ten days of age a nestling rises to stretch on the nest its companions will crowd about it and "beg" in the same excited manner, as if it were really the parent just alighted on the nest with food in bill.

All birds form associations with their nest or the spot on which they are born, and to most it signifies warmth, a place to be fed, and comfort in general. In some cases the young learn to return to the nest, and may go in and out of it for days or weeks. Altricious birds when once out of the nest seldom return, but this is not due to any lack of association, but to their rising instinct of fear favoring that of flight, or at least the desertion of the nest and possibly their concealment by hiding, when the attunement of these instincts is imperfect. In a few cases the same nest or nest-site may be occupied by the same birds for many successive years. There is no evidence that the young of any birds distinguish their nest as a *nest* at all, or as anything more than a place, as a part of a tree or of the earth.

The young kingfisher spends four weeks in its underground tunnel, and towards the close of this period, as I have explained elsewhere, it acquires the curious habit of walking backward. In the education of the young bird it is not necessary to assume that any conscious or deliberate part is ever played by the adults. The phenomena are satisfactorily accounted for by instinct, including imitation on an instinctive basis, and association, involving

experience and the power to learn. In altricious birds imitation is not very effective before the young leave the nest, but is more marked in precocious birds at an early period. Imitation is most striking in fully grown but immature young, as in bluebirds, which still follow their parents, but are not wholly dependent upon them, or in gull chicks, which are fed by regurgitation, and often have to wait a long time before the food is produced.

Does the adult bird show intelligence in serving the proper quantity of food, and in distributing it to the young? The answer is no! What the old bird really does in effect is to "test" the reaction of the throat of each nestling, and await the response. If a bird does not respond quickly the food is withdrawn and another is tested. Thus is the food always passed around until a bird with the proper reaction time is found. There is no evidence that such "tests" are deliberately or consciously made. The amount of food taken by the young is determined reflexly by the gullet, which acts as a brake upon the tendency of the young to gorge itself to suffocation. The bird with full gullet can not as a rule respond, and must wait.

Does the old bird display intelligence in the kind of food served, or in the treatment which it receives? It probably does. While a good deal of instinct is involved in all these matters, the parent does not act like a machine, but the young are provided with food adapted to their growing needs. A gull chick, one half hour old, gets small pieces of predigested fish, while at three weeks of age it may be invited to bolt an entire squid.

What can be said of the general intelligence displayed by old birds? We find that their various instincts become modified or refined by habit or association at almost every step. Thus behavior becomes ever more definite, and their life tends to run in grooves. They quickly form the habit of going to their nesting site by a definite path. If the branch which holds the nest is cut off and removed but a few feet away, the old bird will try to follow her usual course and hover at the point in space formerly occupied by the nest, even when in sight of her young, and will repeat these actions many times before actually going to the nest. But this behavior abruptly ends when the new site of the nest is once visited. After the nest is built, or even while construction is in progress, a definite habit of approach is formed, which may involve walking along a certain limb or grasping certain twigs. The habit of entering the nest from a certain side, facing the same way while sitting on the eggs, grasping the same branch when inspecting or cleaning the nest, and leaving the nest in a definite manner, are all more or less stereotyped and fixed by habit in a relatively brief course of time.

Do birds discriminate their own eggs and proper young? Very many do not, but some do, sooner or later. The success of the European cuckoo, or the American cowbird, whose young are reared by foster parents of many species, would argue for little power in this direction. Yet, in some cases, the foreign body is removed, or the nest is deserted through fear.

In the cyclical instincts of the reproductive period intelligence in the wild bird is mainly displayed by the formation of habits through association. In the same way drinking and bathing places, perches, spots for dusting, for sun-bathing and sleeping are resorted to by habit, for longer or shorter periods, according to the other conditions which modify behavior.

How does the wild bird meet emergencies? Do their acts ever suggest abstract thought, deliberation and planning, and do they generally offer any effective aid to companions in distress? Such important

subjects can not be summarily dismissed. Many observations would certainly warrant a negative answer to the last two questions, while some would not. Not only do we need more pertinent and reliable observations, but a more exact analysis, as well as more certain criteria.

A chipping sparrow will pluck a horse hair from the mouth of a nestling, while another bird like an oriole will stand by and see its mate hung until dead without attempting to release it. A robin will tug at a string which has caught on a limb, but is never seen to fully meet the situation by releasing the string. It will make several turns of a cord about a limb and leave the other end to hang free without any relation to the nest, so that its effort is useless. It ties no knots. The gull, according to abundant and competent testimony, will carry shellfish to a considerable height, drop them on the rocks or hard ground, and repeat the experiment until it gets the soft meat. This suggests adaptive intelligence or even analogical reasoning, but probably does not rise above the level of associative memory. The habit is probably casually formed, and is certainly rare.

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SCIENTIFIC BOOKS

Early Devonic History of Northeastern North America. Memoir 9, New York State Museum, New York State Education Department, 366 pp., 48 plates, sections, diagrams, maps, etc. Albany, 1908. By J. M. Clarke, State Geologist, and Director of the New York State Museum.

In this magnificent memoir, with its princely plates and exquisite illustrations, the state of New York has once more shown the world how far science and art had reached towards a realization of satisfactory results in describing and illustrating the hard facts of geology in an orderly and delightful manner.

To the student of paleontology and stratigraphical geology this handsome contribution to the history of early Devonian times will be most welcome. It fills a long-felt want, and serves to tie together a number of faunas and formations with others in the State of New York as well as beyond. Science, and geology especially, knows no political boundaries. As Dr. Clarke very aptly puts it, "The New York series of formations spreads away from its typical region to all points of the compass, and in all these directions, however far it extends, light is to be sought for the explication of past geologic conditions in New York." "The state, . . . does not and never can in itself afford the solution of its own problems." Professor James Hall for the sixty-three years that he was in office at Albany had shown that the New York series extended beyond the limits of New York State. The standards laid down by the fathers of geology in northeastern America, like Hall, Logan, Dana, Billings, Emmons and many others, were to be kept high and to the fore.

The subject-matter dealt with by the distinguished successor to James Hall in the memoir before me was obtained by Dr. Clarke in the Peninsula of Gaspé, in southeastern Quebec. After describing the general distribution of the "Early Devonic of New York" and pointing out their extension north and east, he then sets to the task of giving the geology of the region covered by the memoir. The geology of the Forillon, of Percé (a brief sketch of which had appeared in 1903 in advance sheets from the report of the paleontologist, 1904, and in Bulletin 107, Geological Papers, Albany, 1907) the Gaspé sandstones, etc., is followed by descriptions of the various faunas.

Three distinct faunas are noticed, and their rich harvest of forms new to science, or recorded afresh, constitute the bulk of the material on which the memoir is based. They are as follows:

I. Fauna of the St. Alban beds. Forty-eight species.

II. Fauna of the Cape Bon Ami beds. Of this fauna eleven species are recorded.

III. Fauna of the Grande Grève limestones. One hundred and sixty species.

Observations on the Dalmanites of the early Devonian are introduced in the text which throw light upon race characteristics, debility as exemplified in ornamentation of different parts of the organism. *Gaspelichas forillonia,* a new species, is indeed "the most extravagant instance of the development of spines among the trilobites."

This monumental work by Dr. Clarke only serves to enhance his deserved fame as a distinguished paleozoic paleontologist. The plates are all that can be desired, the text likewise is satisfactory, as to both quality and precision. References are made to the good work done in the peninsula by Logan, Billings, Ells, Low and others whom the author does not forget in bestowing names on the new forms met with. Nor does he forget those intrepid missionaries and early French explorers like Lejeune, Jumeau, Lescarbot, Leclercq and de Thune, and the Jerseymen and other settlers of the district who have in any measure contributed to the history and development of Gaspé.

The geology of the "Forillon" with map, is given in which the Gaspé sandstones, the Grande Grève limestones, the Cape Bon Ami beds and the St. Alban beds are separated on paleontological and stratigraphical grounds. This remarkable point juts out into the Gulf of St. Lawrence "like an index finger," from the broad fist of Rosier Cape and Cove, and two of the four geological formations constitute the narrower portion of the slender point, with Cape Gaspé to the north and Shiphead to the south. The vertical distribution of species and the faunas of the different formations and their mode of occurrence are given, together with a special chapter on the "Geology of Percé" in which a geological map in detail is presented giving the succession of the strata, including formations from the Carboniferous down to the Lower Silurian. They comprise the Bonaventure conglomerate (Carboniferous and Devonian in age), the "Percé massive" (Lower Devonian), the Cap Barré massive (Lowest Devonian), Mt. Joli massive, north flank (Upper Silurian), Mt. Joli massive, south flank (Lower Silurian), Cape Canon massive, including limekiln beds (Lower Silurian). The faults noted by Dr. Clarke appear to be of the same character as those of the "Quebec Group" and "Appalachian" folded region, a series of thrust faults, very much like those movements so characteristically described by Lugeon of Switzerland, where strata seem to play leap-frog one over the other. The reproduction of a number of old historic maps and early illustrations of this most interesting and picturesque as well as easily reached region forms no inconspicuous portion of the volume, nor can the delightful water-color reproduction of Percé rock forming the frontispiece go unnoticed. The excellent drawings by Barkentin illustrating the extinct faunas are exquisitely reproduced.

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OTTAWA, ONT.

SOCIETIES AND ACADEMIES

THE MICHIGAN ACADEMY OF SCIENCE

THE academy held its fourteenth annual meeting at Ann Arbor, Mich., April 2, 3 and 4.

The following officers were elected for the coming year:

President—Charles E. Marshall, East Lansing, Mich.

Vice-Presidents:

Section of Agriculture—A. C. Anderson, East Lansing, Mich.

Section of Botany—Wm. E. Praeger, Kalamazoo, Mich.

Section of Geography and Geology—Wm. H. Hobbs, Ann Arbor, Mich.

Section of Sanitary Science—E. C. L. Miller, Detroit, Mich.

Section of Science Teaching—S. D. Magers, Ypsilanti, Mich.

Section of Zoology—D. B. Casteel, Ann Arbor, Mich.

Secretary-Treasurer—Walter G. Sackett, East Lansing, Mich.

Librarian—G. P. Burns, Ann Arbor, Mich.

On the evening of April 3 the members of the academy were very pleasantly entertained at a smoker given by the Research Club of the University of Michigan.

The titles of the papers presented at the meeting are given below:

Presidential address by Professor Mark Jefferson, of the State Normal College, Ypsilanti. Subject, "Man in West Norway" (illustrated).

SECTION OF AGRICULTURE

(A. C. ANDERSON, VICE-PRESIDENT)

"Some Michigan By-products," by Frank S. Kedzie.

"Mutual Interaction of Plant Roots," by J. B. Dandeno.

"Bird Protection and the Farmer," by Walter B. Barrows.

"The Claims of the Michigan Academy of Science," by W. J. Beal.

"The Cost of Weeds to the Crop," by J. A. Jeffery.

"Studies in Insect Control," by R. H. Pettit.

"Unsolved Problems in Incubation," by J. G. Halpin.

"Variations in the Proteid Content of Corn as shown by Analyses of Single Kernels from the Same Ear," by Andrew J. Patten.

SECTION OF BOTANY

(W. E. PRAEGER, VICE-PRESIDENT)

"More about the Botanical Terra Incognita in and around Ann Arbor," by S. Alexander, Ann Arbor.

"Some Interesting Variations of Common Plants," by Chas. A. Davis, Ann Arbor.

"An Iris New to Michigan," by Chas. A. Davis.

"Seedlings of *Ranunculus Purshii*," by Chas. A. Davis.

"Additional Notes on *Chara*," by Ellen B. Bach, Ann Arbor.

"A Botanical Trip to Thunder Bay Island," by C. K. Dodge, Port Huron.

"Temperature Variations in Peat Bogs," by G. P. Burns, Ann Arbor.

"Problem of the Causes of the Formation of Mechanical Tissues in Plants," by F. C. Newcombe, Ann Arbor.

"Effect of Longitudinal Traction in the Formation of Mechanical Tissue in Stems," by John A. Bordner, Ann Arbor.

"Response of Tendrils to Traction," by Warren D. Bush, Ann Arbor.

"Effect of Swaying by the Wind on the Formation of Mechanical Tissue," by Maude Gilchrist, Agricultural College.

"Poisonous Excretions of Roots," by Richard M. Zeeuw, Ann Arbor.

"Mychorhiza on Michigan Trees," by D. M. Matthews and G. A. Duthie, Ann Arbor.

"Some Mycorhiza-forming Basidiomycetes," by L. H. Pennington, Ann Arbor.

"Can *Fusaria* assimilate Free Nitrogen?" by L. H. Pennington.

"Is Brown-rot of Stone Fruits in Michigan due to *Sclerotina fructigena* or *S. cinerea?*" by J. B. Pollock, Ann Arbor.

"The Ascus Stage of *Sclerotina fructigena*," by J. B. Dandeno, Agricultural College.

"Capillarity of Cellulose," by J. B. Dandeno.

"Toxic Action of Bordeaux Mixture and of Certain Solutions on Spores of Fungi," by J. B. Dandeno.

"Unreported Michigan Fungi for 1907, with an Outline of the Gasteromycetes of the State," by C. H. Kauffmann, Ann Arbor.

"The Development of *Secotium acuminatum* Mont.," by C. H. Kauffmann.

SECTION OF GEOLOGY AND GEOGRAPHY

(E. H. KRAUS, VICE-PRESIDENT)

"Pleistocene Beaches of Saginaw County," by W. F. Cooper, Lansing.

"Note on the Intercalated Devonian Bed (Anderson Limestone) of the Detroit River Region,"[1] by W. H. Sherzer, Ypsilanti.

"The Nature, Distribution and Origin of the Sylvania Sandstone,"[1] by A. W. Grabau, New York, and W. H. Sherzer, Ypsilanti.

"The Decomposition of a Boulder in the Calumet and Hecla Conglomerate," by A. C. Lane, Lansing.

"Some Possible Uses for Peat in Michigan," by C. A. Davis, Ann Arbor.

"Peat Deposits as Geological Records," by C. A. Davis.

"On the Discovery of Permian Reptiles in Pennsylvania and the Bearing of this Discovery on the Pennsylvanian-Permian Border-line," by E. C. Case, Ann Arbor.

"Interpretation of the Chemical Composition of the Mineral Benitoite," by E. H. Kraus, Ann Arbor.

"Cobalt-nickel-silver Deposits of the Cobalt District of Ontario," by R. E. Hore, Ann Arbor.

"Models for the Practical Solution of Problems in Structural Geology," by W. H. Hobbs, Ann Arbor.

"A Deduction from the Study of Bridges which

[1] With the permission of the State Geological Survey.

have been disturbed by Earthquakes," by W. H. Hobbs.

"Daily Range of Temperature," by M. S. W. Jefferson, Ypsilanti.

SECTION OF SANITARY SCIENCE

(JAS. G. CUMMING, VICE-PRESIDENT)

"Present Scope of the National Red Cross," by B. S. Rowland.

"Urticaria Following the Second Administration of Anti-diphtheritic Toxin," by Alexander W. Blain, Jr.

"A Course in Practical Pathology," by F. P. Rouse.

"Blood-sucking Flies," by F. G. Novy.

"The Water Supply of Detroit," by E. H. Hayward.

"Medical Inspection of Schools," by Guy S. Kiefer.

"Sanitation as a Business Proposition," by Frank W. Shumway.

"The Development of Certain Milk Bacteria at a Low Temperature," by W. S. Sayer.

"Bacteriological Studies of Dry and Moist Soil," by Otto Rahn.

"Different Forms of Immunity," by V. C. Vaughan, Sr.

"Opsonic Technique with Lantern Demonstration," by E. C. S. Miller.

"Spirilla of Relapsing Fever," by F. G. Novy.

"Sensitization and its Application to Practical Medicine," by V. C. Vaughan, Jr.

"Bacteria in Ann Arbor Water," by H. D. Boyles.

"The Hydrolytic Cleavage Products of *B. coli communis*," by J. H. Agnew.

"Syphilis of the Placenta," by R. Genung Seland.

"Rabies-hydrophobia," by Jas. G. Cumming.

SECTION OF SCIENCE TEACHING

(S. D. MAGERS, VICE-PRESIDENT)

Biological Conference of Schoolmasters' Club and Science Teaching Section of the Michigan Academy of Science.

"Parental Care of Michigan Fishes" (illustrated with lantern slides), by Jacob Reighard, University of Michigan.

"The Just Claims of Biology in the Curriculum of Secondary Schools," by Otis W. Caldwell, University of Chicago.

"Shall the Study of Botany and Zoology in Secondary Schools take the Form of the Study of Types?" by Nathan A. Harvey, State Normal College.

"Shall the Study of Botany and Zoology in Secondary Schools take the form of Natural History?" by W. P. Holt, Toledo (Ohio) Central High School.

Discussion of second paper, Wm. E. Praeger, Kalamazoo College.

Discussion of third and fourth papers, Miss Grace Ellis, Grand Rapids, Mich., and H. M. MacCurdy, Alma College.

SECTION OF ZOOLOGY

(ALEXANDER G. RUTHVEN, VICE-PRESIDENT)

"A Case of Consecutive Hermaphroditism in the Killifish, *Fundulus majalis*," by H. H. Newman.

"The Bird Environment of the Ann Arbor (Michigan) Quadrangle, with Notes on the Rarer Species," by N. A. Wood.

"Permian Glaciation and the Distribution of Permian Reptiles; a Study in the Geographic Distribution," by E. C. Case.

"Reptiles of Michigan," by Frances Dunbar.

"Additional Experiments on Color Vision in Fishes," by Jacob Reighard.

"Remarks on the Vertebrate Fauna of Northwestern Iowa," by A. G. Ruthven.

"The Ornis of Northwestern Iowa," by Max M. Peet.

"The Bird Life of School Girls Glen (Ann Arbor, Mich.); a Local Ornithological Study," by A. D. Tinker.

"The Distribution of *Lymnæa* in Michigan," by Bryant Walker.

"A Reflecting Water-glass," with a demonstration of the apparatus, by Jacob Reighard.

"On a Method of Sub-aquatic Photography," with a demonstration of apparatus and results, by Jacob Reighard.

"A Statistical Study of Mitosis and Amitosis in an Embryonic Tissue," by O. C. Glaser.

"Observations on the Habits and Life History of Notonectid," by S. F. Hull.

"A Preliminary Note on Insecticides," by R. H. Pettit.

"A Possible Parasitic Habit in the Lepidoptera," by R. H. Pettit.

"Notes on a Biological Survey of the Alma Area," by Hansford MacCurdy.

WALTER G. SACKETT,
Secretary

THE TORREY BOTANICAL CLUB

The club was called to order on April 14, 1908, at 8:30 o'clock, by Vice-president John Hendley Barnhart. Seven persons were present.

The scientific program consisted of two papers, as follows:

The Relation of Chemical Stimulation to Nitrogen Fixation in Sterigmatocystis: Marion E. Latham.

This paper will appear in full in a future number of the *Bulletin* of the club.

Some Forms of Protoplasmic Reaction: H. M. Richards.

The speaker reviewed the more recent literature and theories bearing on the subject of the stimulus and response of protoplasm.

Both of these papers were followed by an interesting discussion, and the meeting adjourned at ten o'clock.

C. Stuart Gager,
Secretary

THE AMERICAN CHEMICAL SOCIETY. NEW YORK SECTION

The eighth regular meeting of the session of 1907–8 was held at the Chemists' Club, 108 West 55th Street, on May 8.

Professor Charles E. Munroe, of the George Washington University, addressed the Section on, "Explosions in Mines."

C. M. Joyce,
Secretary

DISCUSSION AND CORRESPONDENCE

THE GERMAN ANATOMICAL SOCIETY

To the Editor of Science: During the recent meeting of the Anatomische Gesellschaft, at Berlin, I noticed several points of management and procedure which seemed to me of value in economy of time, and I send you my notes with the hope that their publication may interest those in charge of the meetings of similar organizations in America.

In the first place, the meetings of our societies often suffer by reason of overcrowded programs. There is not time to present all the papers presented and the chances for discussion of those which are read are reduced to a minimum.

In the German society the number of papers to be presented at a single session is limited by statute to twenty-five and usually but about that number is printed on the preliminary program. This year, owing to the number of titles sent in at an early date, the number was increased to thirty-nine, those in excess to be read only in case others ahead of them were omitted for one reason or another.

This restriction of number of papers allows an increase of the time limit for each person to twenty minutes, but one person is allowed only one place on the program, although he may give two or more papers, provided that he do not overrun his allotted third of an hour. Only once did I notice that a speaker overran his time and he was called to order by the president.

As a rule, the speakers went at once straight to the pith of their communications; wasting no time in historical summaries of previous knowledge of the subject, details of technique or minutiæ of diagrams or specimens exhibited, which only tire and confuse the listener who only wishes to know the new points and the broadest evidence upon which the conclusions are based. Knowing these, he can wait for details until the complete paper is published.

The sessions were announced to begin at 9 A.M. instead of ten o'clock, as is usual with us, and they lived up pretty closely to this schedule. This apparently was well understood, as when the meeting was called to order a goodly audience was present. Were the Americans ever to live up to their late program hour, calling the meeting to order at 10 o'clock instead of "dawdling" until most of the members had got together, the lesson of punctuality would soon be learned and considerable time would be saved.

With this limitation of the number of papers and the economy of time which has been alluded to, there was abundant time for discussion, and all must admit that discussion is frequently as valuable as, sometimes more valuable than, the paper itself. In these dis-

cussions there appeared a feature which struck me as of the greatest value. With us the discussion is rarely, if ever, reported, but at Berlin as soon as a speaker had finished his discussion, a page handed him a folio of cardboard with pencil, paper and blotting paper (there are fountain pens in Germany), and the substance of his remarks was at once jotted down and handed to the secretary. For any society which wishes to publish a full account of its proceedings some such method would be of great importance, while any one who has ever acted as secretary and has later tried to get together abstracts of the discussion will at once recognize its value.

J. S. KINGSLEY

PARIS,
April 28, 1908

DATES OF EARLY SANTORIN AND ISCHIAN ERUPTIONS

OWING to conflicting literary sources and the difficulty of reconciling them, the chronology of early volcanic eruptions in islands of the Mediterranean, especially those of the ancient Thera and Pithecusæ, is involved in much uncertainty. The dates assigned to the first two or three eruptions of Thera have been the subject of much discussion, as it is a matter of some historical importance that they should be determined with as much precision as possible, in order thereby to fix divers contemporary events.

A welcome contribution to the literature of this subject is to be found in a recent number of *Hermes* (43, p. 314), in an article by Professor A. Klotz, of Strassburg, entitled "Die Insel Thia." Reasons are given by him for regarding the following as authentic dates of the first three outbreaks of the Santorin group known to have taken place during continuous history: B.C. 196 and 66; A.D. 46. Through a misunderstanding of Pliny's text the last of these is commonly referred to the year 19 A.D., and the intermediate one is seldom mentioned in geological treatises. For a list of eruptions occurring during our present era one may consult the writings of Fouqué and Alfred Philippson, the latter in volume 1 of "Thera" (1899). These two geologists, and also H. S. Washington,[1] have discussed the physical evidence for estimating the time-interval since the earliest eruption of all which can be associated with a period of human culture, and find reason for assigning it to the proto-Mycenæan, or roughly speaking, 2000 B.C.

Early Ischian eruptions have likewise afforded material for debate. A list of all known disturbances is given by Fuchs in his elaborate monograph, "L'Isola d'Ischia," and a slightly different chronology is proposed by Ettore Pais in his recent volume on "Ancient Italy" (1908). According to this author, we have authentic accounts of four eruptions of Epomeus during classical antiquity, as follows: (1) a very early one which drove out the Eretrians and Chalcidians; (2) that which occurred shortly after 474 B.C., and caused the Syracusans to leave the island; (3) that which took place shortly before the birth of Timæus (*ante* 352 B.C.); and (4) one in 91 B.C., which is mentioned by Julius Obsequens. The same author also undertakes to identify the circular lake described by Pliny as having been formed by an earthquake, with the modern Porto d'Ischia.

C. R. EASTMAN

HARVARD UNIVERSITY

SPECIAL ARTICLES

A NOTE ON THE PROPORTION OF INJURED INDIVIDUALS IN A NATURAL GROUP OF BUFO

IN "Darwinism To-Day" (p. 84) Kellogg draws attention to Conn's reference to a maimed frog which was able, in its natural environment, to survive so serious a loss as the whole of both feet, as illustrating the idea that "selection is not so rigid as to eliminate *all* unfit individuals." Probably every naturalist could cite from his own experience many analogous instances of survival after more or less severe injury. Little is known, however, regarding the actual proportion of maimed individuals in a given group.

In making a study of correlation[2] in the common toad (*Bufo lentiginosus americanus*, LeC.) I had the rather unusual opportunity

[1] *Amer. Journ. Arch.*, **9**, p. 504.

[2] *Jour. Exp. Zool.*, IV., 4, 1907.

of individually examining practically an entire natural group and was surprised by what seemed to me the large proportion of injured individuals which were able to live on in an apparently normal fashion. The society consisted of about 450 toads, of which 434 came under careful observation. Of these, 22, or 5.07 per cent., were noticed which showed the results of injury. Many of these injuries were slight, to be sure, yet from the point of view which Conn and Kellogg were considering they should be counted. The list of injured was as follows:

Parts of toes lost, one or both feet: 13 individuals.

One or both feet crushed: 2 individuals. These both were recently wounded and might not have survived long.

Old flesh wounds on arm, thigh and side of body: 1 individual.

Shank broken, healed and 1 to 2 mm. shorter than normal: 4 individuals.

One foot missing and fresh wound on ankle: 1 individual.

Right hand and foot missing: 1 individual. Stumps covered with heavy callosities. In this specimen the normal gastrocnemius muscle weighed 0.435 g., while that of the injured side weighed but 0.180 g.

Shoulder-girdle (coracoid and clavicle) broken completely across near the mid-line: 1 individual. This break had not healed; the ends projecting ventrally under the skin had become covered with heavy callosities.

That injuries such as these are not very considerable factors in non-survival is indicated by the fact that the average weight of the 22 injured specimens was not very different from that of the entire colony—38.5 g., as compared with 44.8 g. The number of injured seems too small to justify the application of precise methods of comparison.

There is the possibility that the males are more liable to injury than the females, since the ratio of injured males to injured females is as 9:10, while in the entire group the ratio is less than 7:10. This is of interest in connection with the fact, brought out in my study on correlation, that the males are throughout their organization less perfectly correlated than the females. Their lower degree of structural correlation may be partly responsible for their greater liability to injury.

But this 5 per cent. injured does not tell the whole story. In addition 16 individuals, or 3.68 per cent., were noticed showing structural "abnormalities," which would seem to have been at least as serious as regards survival as most of these injuries, perhaps more so, since the individual would be affected throughout its existence, whereas an injury would become a factor only after the individual had probably a fair start in life. The following were noted:

One foot misshapen and small: 2 individuals. Possibly the result of injury when very young.

One foot with six toes: 1 individual.

One foot with four toes: 1 individual.

One foot with three toes: 1 individual.

Gall-bladder absent: 5 individuals.

One lobe of liver more or less completely reduced: 5 individuals.

Ventricle deeply furrowed ventrally: 1 individual. Possibly the result of injury when very young.

These individuals were again nearly but not quite of average weight and the males were far outnumbered by the females, the normal ratio of 7:10 being reduced here to 2.3:10. This might possibly indicate that the more perfectly correlated females are the better able to survive congenital abnormality.

This gives a total then of 8.75 per cent. of a natural animal group showing injuries or "abnormalities" which would seem to be rather serious handicaps, but which prove not to be such. Probably other injured or "abnormal" specimens would have been found if attention had been directed toward the subject at the time of observation.

It may or it may not be permissible from the present point of view to include in the list of "abnormal," six specimens of a distinct "variety" distinguished by color and markings, odor, external proportions, character of skin, etc. If these should be included as ab-

normal the total percentage of "unfit" runs up to 10.1.

It should be added that, on the whole, conditions of life were not rigorous for this group. Food was more than abundant, means of protection and concealment ready, and natural enemies apparently not numerous, so that these percentages may prove to be unusual. They certainly seemed so to me and they are noted here not only as bearing on the general subject of selection, but in the hope that others may make known similar data.

WM. E. KELLICOTT
THE WOMAN'S COLLEGE OF BALTIMORE

BOTANICAL NOTES

FLOWERING PLANT NOTES

W. C. Worsdell in the April, 1908, *Journal of Botany* discusses "The Affinities of *Paeonia*" and concludes that this genus is more closely related to *Magnoliaceae* than to *Ranunculaceae,* but he suggests that it should more properly be referred to a family ("order" in the older sense) by itself which he names *Paeoniaceae.*

Dr. Ernst A. Bessey's paper on "The Florida Strangling Figs," from the forthcoming nineteenth Annual Report of the Missouri Botanical Garden, deals with two native species of *Ficus* (*F. aurea* and *F. populnea*), the first of which has the curious habit of beginning its growth as an epiphyte and later becoming terrestrial by sending down numerous slender roots which eventually thicken and fuse together, finally wholly surrounding and strangling the host. Some striking photographs are reproduced in the plates. The curious fact is brought out that in *F. aurea* the seeds require light in order to germinate, no doubt related to its epiphytic habit.

F. M. Bailey, colonial botanist, continues his systematic "Contributions" in the *Queensland Agricultural Journal,* the November (1907) number containing descriptions of four new orchids from New Guinea, and the February (1908) number one new grass, *Arundinaria coboni* from Queensland.

Professor Doctor J. W. Harshburger has published in the *Proceedings of the American Philosophical Society* (Vol. 46, 1907) a suggestive paper on "Taxonomic Charts of the Monocotyledons and Dicotyledons." Two charts are reproduced, one of the monocotyledons, and the other of the dicotyledons, in which each family is given a place in a genetic tree. In the second chart the Gamopetalae are shown to be derived from two great phyla.

H. S. Hammond publishes a short account (accompanied with a plate of many good figures) of the embryology of *Oxalis corniculata,* in the February (1908) *Ohio Naturalist,* in which he calls attention to "a multicellular haustorium-like organ which is formed from the basal cells of the suspensor," and which burrows its way into the integuments until it finally reaches the testa.

Agnes Chase finds (*Botanical Gazette* for February, 1908) that the grasses of the genus *Triplasis* have fertile cleistogamous flowers enclosed in the sheaths of the stems. In *Amphicarpon amphicarpon* similar cleistogamous flowers occur in the sheaths of the subterranean stems.

Recent numbers of the "Leaflets of Philippine Botany" contain papers on "*Freycinetia* from Lucban," and "Some New Leguminosae" (by A. D. E. Elmer), "Some New and Critical Ferns" (by E. B. Copeland), and "A Fascicle of Tayabas Figs" (by A. D. E. Elmer). In the last paper forty-one species are enumerated.

In a sixty-six-page paper in the *Annals of Botany* for April, 1908, Ethel Sargent discusses the "Reconstruction of a Race of Primitive Angiosperms," this being an abstract of a series of eight lectures delivered in the University of London in May and June, 1907. In it the author holds to the monophyletic origin of the angiosperms, and avows her "complete agreement with the general conclusions" reached by Arber and Parkin in their "Origin of Angiosperms." These general conclusions, it will be remembered, are that the angiosperms were derived from cycadean ancestors similar to *Bennettites,* and

that the Ranal is the most primitive of the angiospermous types. The paper is well worth reading at this time when botanists are looking with increasing favor upon the strobilar theory in their speculations as to the origin of the angiospermous flower and, as a result, the origin of the group of *Angiospermae*.

BIOGRAPHICAL NOTES

As an echo of the very general celebration of the bicentenary of Linné, the altogether admirable biographical sketch entitled "Carl von Linné" by Professor Dr. N. Wille is worthy of mention. Originally published in "Samtiden" for 1907, it is now republished as an eleven-page pamphlet in the Norwegian language, and is accompanied by a good portrait of Linné as he appeared about the time when he issued his greatest works, the "Species Plantarum" and the "Genera Plantarum."

A pamphlet entitled "Memorials of Lucien Marcus Underwood" is a sad reminder of the loss which botanical science sustained by the death of the distinguished botanist. The first paper is a biographical sketch by Dr. C. C. Curtis. From it we learn that he was born October 26, 1853, on a farm in central New York, a region already famous as the birthplace, nearly half a century earlier, of Dr. Asa Gray. Here he spent his boyhood working on the farm, attending first the country district school, and later a near-by academy (seminary), still later he went to college (Syracuse University), graduating in 1877. Then came a period of teaching various subjects in various places, including the Morrisville Union School, Cazenovia Seminary, Hedding College (Ill.), Wesleyan University (Ill.), Syracuse University, DuPauw University, Polytechnic Institute (Ala.) and Columbia University (1896). Eleven years of fruitful work in the university and the New York Botanical Garden, and then came the end on November 16, 1907. The second paper is an appreciative tribute by Dr. M. A. Howe, and this is followed by a list of publications including 212 titles. On examination one finds that more than half of these titles deal with *Hepaticae* and *Pteridophyta*. His first paper appeared in 1878 and the last in 1907. The pamphlet closes with a collection of the resolutions passed by various institutions and societies.

A considerable portion of the April number of the *Journal of Mycology* is given to the life and work of William Ashbrook Kellerman, its founder and editor. He was born in Ashville, Ohio, May 1, 1850, received his collegiate education in Cornell University (graduating in 1874) and the University of Zurich (Ph.D., 1881). For five years he was a teacher in a state normal school (Wisconsin), then professor of botany in the Agricultural College of Kansas, from which he transferred to the Ohio State University in 1891. Four years ago he organized a scientific expedition to Guatemala, and followed it with a second, third and fourth. In the last, when near the end of the trip, he was stricken with a disease which caused his death March 8, 1908. The list of his publications includes upwards of 232 titles. His first paper, on the development of the flowers of *Gunnera chilensis* (inaugural dissertation), appeared in 1881, and the last installment of his well-known and very useful "Index to North American Mycology" was issued in the current number of the *Journal of Mycology*, on April 15, 1908. In 1885, with J. B. Ellis and B. M. Everhart, he began the publication of the *Journal of Mycology*, continuing it until its transfer to the United States Department of Agriculture, four years later, and resuming its publication again in 1902 and continuing it until his death. In 1903 he began the publication of a most helpful leaflet, the *Mycological Bulletin*, designed to help teachers and pupils in the public schools to know something about fungi. In the words of his sympathetic biographer, "the loss of such a man, upright in character, possessed of lofty ideals, and an enthusiasm which was an inspiration to all with whom he came in contact, will be felt not only by his students, but by botanists the world over."

Professor Dr. Pammel has rendered a distinct service to botanists in the preparation of a sketch of the life and work of Dr. Edwin James, and its publication in the *Annals of Iowa* (Vol. VII.). Edwin James was born

on a farm in Vermont, August 27, 1797, fitted for college in the country grammar school, graduated from Middlebury College in 1816. Later he studied medicine and thus acquired the degree of doctor of medicine. In 1820 he became the botanist and surgeon to Major Long's expedition to the Rocky Mountains. Ten years later he resigned from the army, and within a few years settled near Burlington, Iowa, where he engaged in farming. He died October 25, 1861. *Jamesia,* a very pretty Rocky Mountain shrub of the botanical family *Saxifragaceae* was dedicated to him by Torrey and Gray.

CHARLES E. BESSEY
THE UNIVERSITY OF NEBRASKA

THE ADMINISTRATION OF SYRACUSE UNIVERSITY[1]

SYRACUSE, N. Y., April 17, 1908.

DEAN WILLIAM KENT,
Syracuse University.

Dear Sir: The executive committee and the chancellor are firmly though reluctantly persuaded that your usefulness in this university is at an end and that your continued presence among us would be increasingly prejudicial to the peace and success of the university.

You have been a disappointment to the administration from almost the beginning of your official relation to the institution. We can not hope that you will be capable of any improvement in the future.

Without going into particulars, you will appreciate the fact that the trustees of a university can not possibly retain a dean who can not meet the chancellor or president of the institution upon amicable and even confidential terms and whom the chancellor can not address concerning the work of his college without being subject to the embarrassment of controversy and contention.

As much as I regret therefore the duty that is imposed upon me, I am compelled, acting upon the advice and with the unanimous concurrence of the executive committee of Syracuse University, to inform you that your connection with the university will be terminated with the close of the present college year. I am advised further by the executive committee to inform you that if you prefer to submit your resignation, you may have that privilege.

Very truly yours,

JAMES R. DAY,
Chancellor

SYRACUSE, N. Y., April 20, 1908.

CHANCELLOR JAMES R. DAY,
Syracuse University.

Dear Sir: I beg to acknowledge receipt of your favor of the 17th inst., informing me of the unanimous action of the executive committee, and giving me the privilege of submitting my resignation.

Before deciding whether to submit my resignation now or to ask you to prefer charges against me and to let me be heard in my defense before being dismissed by a vote of not less than twelve trustees, according to section 4 of the university charter, I ask you to be more specific in regard to the following statement in your letter:

"You have been a disappointment to the administration from almost the beginning of your official relation to the institution. We can not hope that you will be capable of any improvement in the future."

If I have been a disappointment to the administration (I suppose that means yourself personally) I have not, as far as I know, been a disappointment to the trustees, faculty, students or alumni. I have not only done my duty as dean and professor of mechanical engineering to the best of my ability, but with all due modesty, I think no one else could have done it any better in my place. This question I am willing to leave to the judgment of experts in engineering education.

If I leave here at the end of five years' hard service it is only fair that my efforts in behalf of the college should receive such commendation from the board of trustees as I think they deserve, and that it should be made clear that I leave here not on account of any failure in my duty as dean or professor nor for any lack of ability as teacher or administrator, but only on account of the personal feelings of the chancellor.

I therefore request that you appoint a committee of three trustees, not members of the executive committee, to investigate into all matters relating to my administration of the offices I have held for the past five years, and report their conclusion to the executive committee.

Yours truly,

WILLIAM KENT,
Dean of College of Applied Science

[1] There is here printed the recent correspondence between the Rev. Dr. James R. Day, chancellor of Syracuse University, and Professor Wm. Kent, dean of the College of Applied Science, together with a statement which Professor Kent has prepared at the request of the editor.

SYRACUSE, N. Y., April 21, 1908.

DEAN WILLIAM KENT,
Syracuse University.

Dear Sir: Answering your letter of April 20, there is no provision in our charter and by-laws nor is there any precedent for the trial of an officer or professor of the university whose connection with the institution it is desired to terminate.

There is no reason for any departure from the usual procedure in your case. Therefore it is certain that the trustees will not establish the precedent which you demand.

If you do not care to accept the alternative of a resignation, then the report of the committee will be presented to the trustees for their action. The language of the report is: "The executive committee, believing that the interests of the university require that harmonious relations should exist between the administrative heads of the university and the deans of the several faculties, is of the opinion, in view of the circumstances, that the connection of Dean Kent with the university should be terminated, and recommends that the matter be presented to the board of trustees at the next annual meeting."

The resolution was presented by one of the most eminent and judicial members of the committee and adopted unanimously. The provision permitting you to resign was adopted later, entirely as an alternative which you might prefer.

As to the number of trustees required to act in such cases: as the June meeting is never short of the required quorum, the action will be final and completed at that meeting.

If the chancellor's "personal feelings" were the only ground of complaint, that were enough. The trustees of this or any other university would not retain a dean objectionable to the head of the institution. That appears in the action already taken. It is not necessary to raise the question of the impression you have made upon any of the members of the executive committee or our patrons.

Understand the matter clearly: You are offered the privilege of presenting your resignation if you prefer. If you do not, your removal will be recommended to the trustees by the unanimous action of the meeting of the executive committee, held April 17. You can have no doubt of the decision in the case.

If you prefer that it take the form of dismissal, you certainly will have that choice. I have no personal wish as to how you decide the matter.

As the executive committee has also requested me to make the necessary recommendation of your successor, and as I have reported to you the action of the committee concerning you, I consider the matter closed, so far as my duty in the case is concerned.

Very truly yours,

JAMES R. DAY,
Chancellor

SYRACUSE, N. Y., April 21, 1908.

CHANCELLOR JAMES R. DAY,
Syracuse University.

Dear Sir: I acknowledge receipt of your favor of 21st inst., containing the report of the executive committee. As it does not appear that there is any occasion for haste in the matter, I will defer my decision for the present.

Yours truly,

WILLIAM KENT,
Dean of College of Applied Science

STATEMENT OF DEAN KENT

According to the charter and by-laws of Syracuse University its government is vested in a board of sixty trustees. The majority, or thirty-two, of them are appointed by certain conferences of the Methodist Church—nearly all of them being Methodist ministers—for terms of six years. The others are mostly business men, or men prominent in finance and in the professions in Syracuse, New York city and other places. All authority is vested in them by the charter, but, as a matter of fact, they have practically divested themselves of this authority and given it to the chancellor, who not only rules the university, but rules the board of trustees. The trustees meet twice a year only, and it is rarely that more than one half of them are present. The business transacted is purely formal. There are no reports of committees on the separate colleges; there are no reports called for from the deans of the colleges. The trustees know practically nothing about the internal working of any of the colleges. Mr. Archbold, the president of the board, is vice-president of the Standard Oil Company and a warm personal friend of the chancellor.

The L. C. Smith College is a school of engineering, but there is not a single engineer on the board of trustees, and during the past five years not a trustee has ever consulted with the dean on the work of the college.

When spoken to about it, some of them have admitted that they were negligent in the matter, but said it was not possible for trustees, who are busy men, to spend any time on details; they necessarily had to leave all such things to the chancellor. Other universities, however, have expert engineers on their boards of trustees who are very active in seeing that the engineering college is kept up to the standard of other engineering colleges throughout the country in methods of administration, in curriculum and in equipment. At Syracuse University the chancellor himself does not take any active interest in the college of applied science. He attends a faculty meeting only once a year, and practically all of his administration of the college is done through the medium of the superintendent of buildings, who acts also as the chancellor's valet and spy.

This superintendent is a rather remarkable man. His connection with the university began as janitor of Crouse College. From that position he has been gradually advanced until he is not only superintendent of buildings, charged with their heating, lighting and repairs, but is also supervisor of new construction and purchasing agent. His salary is equal to that of the highest paid professor in the university, and his power is greater than that of any dean or any faculty. Four years ago he had a quarrel with the professor of practical mechanics in the L. C. Smith College, Professor W. M. Towle, and told tales to the chancellor about him which caused his dismissal. His successor, Professor George D. Babcock, was continually in trouble with the superintendent, who interfered with his work and equipment, and rather than submit longer to his interference he resigned a year ago. Professor Cardullo, who was instructor in machine design, was appointed to succeed Professor Babcock. He is a most able man, a man whom it would be to the best interests of the university to retain, but he also is about to leave on account of the trouble which the superintendent has made for him. My predecessor, acting dean Chas. L. Griffin, had to leave five years ago on account of the actions of the superintendent of buildings. It is entirely probable that the chancellor's prejudice against me is due chiefly to that same man's tale-bearing. Two or three months ago on one occasion he was so grossly insulting to Professor Shepard, of Smith College, that Professor Shepard demanded of the chancellor that the superintendent should make an apology to him or he would at once resign. The chancellor compelled the superintendent to make an apology, which is the only instance known of his being curbed by the chancellor. He is the chancellor's constant companion and confidant and appears to have more influence over him than any other single person in the university. As to his relations to the faculty, students and alumni, it is doubtful if he has a single friend or adherent. It would be difficult to find a man more universally hated. The chancellor seems to be the only man connected with the university who believes in him.

The chancellor has charged me with being a "disappointment to the administration [which means himself] from almost the beginning of his official relation to the institution" but he has not made a single specific charge in that matter. He also says that I can not meet him on amicable terms and that he can not address me concerning the work of the college without being subjected to the embarrassment of controversy and contention. The foundation for all these statements is of the flimsiest possible character. I have never refused to meet the chancellor in an amicable discussion of any subject, and the little controversies we have had have scarcely averaged more than one per year, and usually they lasted not over five minutes. The following is a statement of all my controversies with the chancellor, in five years, so far as I remember them:

1. A few weeks after taking office in 1903, I made a social call on the late Dean McChesney, in his office, in the college of Fine Arts. We discussed the work of the Fine Arts college and the relation of fine arts to education. Dean McChesney mentioned the

call to the chancellor, and the latter called me to account for it, saying, "You are going out of your province as dean in making such visits, and will find plenty of work to do within the four walls of your own college." The idea of such limitation was resented by me and I replied that I did not intend to narrow myself in any such way, but intended to study all educational questions that I wished to and to visit any place where I was welcomed. This talk probably prejudiced the chancellor against me, as it indicated that he was dealing with a man of independent mind, who would not submit to an undeserved rebuke. It also revealed the chancellor's propensity for petty fault finding and scolding, and showed the manner of man with whom I must deal. The incident was of trifling importance, however, and caused no lasting resentment.

2. Relations were very cordial up to January, 1904. I then presented, with a request for their consideration, to the chancellor, a package of letters which had been written, at my request, by the heads of departments of the college, showing what was needed for the improvement of the course and equipment. Accompanying these was a letter of transmittal, giving my own ideas. The letters were discourteously refused, the chancellor saying: "Take them away, I don't want to see them. Don't you know that professors are always asking for everything they can think of?" whereupon I took the letters away leaving only my own with the chancellor. The letter was never answered, and the matter caused no controversy as neither party ever referred to it again.

3. The next friction occurred in June, 1905. The chancellor wrote that he had expelled a certain student belonging to the L. C. Smith College. I replied that the man was not in college, having been dropped seventeen months previously, and that the printing of his name in the catalogue issued April, 1905, was a mistake. The chancellor's attention was also called to about forty names of men who had not been in college during the year beginning September, 1904, yet who were listed in the catalogue. To this the chancellor replied in a letter dated June 13, 1904: "Your trouble is that you have not informed yourself as to the method of listing our students in the catalogue. A student who is present within a catalogue year for any time goes into the catalogue. . . . I do not like to have you state that such a number of students are in our list who are not in college. It reflects upon the institution. Suppose you call on me to discuss such matters as this instead of writing." Accordingly a conference was held in which I protested against padding the catalogue as essentially dishonest, and done for the purpose of misleading people as to the size of the university, and stated that I did not want Smith College misrepresented that way. The chancellor became enraged, and gave a characteristic exhibition of his bad temper, which would lead an onlooker to believe that he is about to have an apoplectic stroke. The rage was short, and we met at the chancellor's reception the next evening, as if nothing had occurred. The catalogue padding continued till this year, when it was changed. The present edition contains a correct list of the students in the L. C. Smith College during the year beginning September, 1907.

4. Another trifling dispute during 1905, concerned a statement I had written for a pamphlet describing the work of the college. This was to the effect that a year of practical instruction in a machine shop, in addition to the high school course, afforded the best preparation for an engineering course. The chancellor struck these words from the manuscript. I protested that I had given not only my own opinion, but that of the most advanced engineering educators on the subject, and offered to show their printed words. The chancellor said he cared for no one's opinion, and would allow no such statement to appear under the imprint of the university.

5. During the college year 1905–6, the chancellor and I attended the annual meeting of the Albany Association of Syracuse Alumni at Schenectady. Although we rode together from Syracuse to Schenectady, the chancellor

would not permit any discussion of college affairs, although the opportunity was excellent. I made a little speech at dinner to the alumni and said to thirteen from the College of Applied Science, who were in the employ of the General Electric Co., at Schenectady, that I hoped they would soon be so numerous and strong in influence that they could elect one of their number to an alumni trusteeship, so that their college could be represented by its own alumni. For this I was taken to task by the chancellor, who stated that the alumni trustees represented the university rather than any particular college. To this, I replied, that the plan of having each college represented on the board of trustees was a good one, and one that would soon be acted on if the university grew. This talk indicated to the chancellor that he and I had radically different ideas on university government. No further differences occurred until December, 1906.

6. On December 11, 1906, while I was in the chancellor's office on formal business, he stated that complaints had been made of disorder in L. C. Smith College—"rough housing," he called it—and that he wanted it stopped. At the perfectly natural inquiry as to who had told him, the chancellor became violently angry and began to rage. I left the room as soon as possible without losing my temper, or creating any disturbance. This trouble did not blow over as quietly as others had done, for the next day the chancellor sent a three-page, scolding letter beginning as follows: "My dear Dean Kent—I wish you to decide between this time and the meeting of the trustees in January as to whether you are to act harmoniously with the administration of this university and treat the chancellor with civility and respect. I will not permit you to repeat the incident of yesterday morning in my office and the language which you used after you left my office." Another paragraph contained the most remarkable statement: "I called your attention to certain lack of discipline in your college. You had no right whatever to begin to interrogate me as to who the authority was in the case, and if you had had experience as an educator you probably would not have done so. It would have occurred to you that that would be impossible." This letter created a difficult situation. It was from a peevish, irritable man, under a severe nervous strain from the castigations of the press for six months past, on account of his violent attacks on President Roosevelt, and a man incapable of reasoning in the same manner as other men. It was also evident that he had been misled by some tale bearer and held exaggerated ideas as to slight breaches of discipline. In such a case, no answer but a most abject apology would satisfy him, such as no man would write and retain his self-respect. Therefore, a long letter was sent him, from which the following is quoted:

> Replying to yours of the 13th inst., I do not need to wait a single day to decide that it is my honest intention to act harmoniously with the administration of the university and to treat the chancellor with civility and respect. I am not aware that I have failed to do this in the past.
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> You speak of the "incident yesterday morning" in your office. As far as I can remember that incident, it was merely that you informed me that complaints had been made to you of "rough-housing," as you called it, in this college, and I asked you the perfectly natural question who made the complaints and why did the person who made them not make them to me, and you refused to give me the information. If I am wrong in this statement of the incident, I wish you would correct me.
>
> . . . You say I have "no right whatever to begin to interrogate" you "as to who was the authority in the case." Perhaps I have no right to interrogate you about this or any other matter, but if my ability as an administrator is attacked by persons making complaints, I think I ought to know who makes such complaints, and to have them made not in general terms, but with detailed specifications as to the particular things complained of, with dates of the events, and the names of the offending students if they are known. Then I can intelligently take such steps as may be necessary to punish the offender and to prevent a repetition of the offense.

To this the chancellor replied with a long characteristic letter, in which the following sentences appear: "I do not propose to permit

you to act the 'bull in the china shop,'" "I will be the judge of whether I shall give you the names," "Permit me to say that I do not wish that question raised in the future. When I tell you that there are certain things in your college that require correction, I wish it to be accepted as sufficient authority that I make this statement. I am responsible for it, and I don't propose to have you put me on the witness stand for cross-examination. It is simply a piece of insolence." To this I replied in a short letter in part as follows: "It will make it much easier for me to suppress disorder if, when it is complained of to you and not to me, you will request the person making the complaint, if he (or she) is connected with the university to make it to me direct, and furnish me with the particulars of the occurrence so that I can investigate it promptly. . . . There are several remarks in your letter which are of a personal nature and have nothing to do with the main question, viz.: the question of disorder in this college, and I do not refer to them further than to say that my judgment differs from yours, but yet I hope we may differ as gentlemen and remain on cordial terms." The chancellor then gave his ideas on the duty of a dean in a three-page letter, in which he said: "It is not for you to tell me what to do in the premises. It seems to be an exceedingly difficult thing for you to learn the duties and limitations of your office as dean. You are not acting in any independent capacity or in an independent college. You are in your position to assist the chancellor." He closed with stating, "You will please to consider this incident closed with this letter, if you propose to work with me upon the terms which happily exist between myself and the other deans." I, of course, considered the incident closed.

7. The next difficulty did not come up for about thirteen months. Outbursts on the part of the chancellor, of the character outlined above, happened only once or twice a year, and I considered that I did not need to think of resigning for at least a year, as I saw the chancellor not over twice a month and then only for five or ten minutes at a time. During the thirteen months, the chancellor attended only one Smith College faculty meeting, and did not meet me in the college except on that occasion. Finally, in January or February, 1908, there were three conflicts, all originating in one source—the interference of the superintendent of buildings with Professor Cardullo, professor of practical mechanics. He made two attacks on Cardullo to the chancellor: (*a*) for fixing the brushes of an electric motor without consulting him; (*b*) for not compelling students to clean their lathes after using them. These attacks were due solely to the superintendent's animosity to Cardullo, and I so told the chancellor, thereby arousing his wrath. The third conflict occurred when I requested the chancellor to make an inducement for Professor Cardullo to remain at Syracuse, he having applied for a position to the dean of a western college. This caused another outburst of rage from the chancellor.

The above are the only conflicts of any importance I had with the chancellor up to April 17, 1908, when I received the chancellor's letter of dismissal. On all of these occasions I could have met him on amicable terms for a friendly discussion, had not his dictatorial and discourteous manner made such a discussion impossible.

In regard to my administration of the offices of dean and professor of mechanical engineering, as far as I am aware, no complaint has ever been made against me by any trustee, professor, student or alumnus, nor has any one of them said that I ever treated him otherwise than with courtesy and consideration. It is difficult to come to any other conclusion than that the sole reason for my dismissal is the irrational personal feeling of the chancellor, due to my not submitting humbly to his petty fault-finding and scolding.

It will be difficult for any one not personally acquainted with the chancellor to understand the existing state of things at Syracuse University, and how it is possible that the head of a great university could act as he has done. Perhaps a brief statement

of the personality and the ideals of the chancellor may explain the situation.

The reason why Syracuse University is what it is is the overpowering personality of the chancellor. He is a large man, physically and otherwise, 63 years of age, and over six feet tall, and weighing over 250 pounds. He has a magnificent voice, a power of eloquence, and mastery of an audience equal to that of William Jennings Bryan and a capacity for invective like that of Senator Jeff Davis. Pompous in carriage, irritable in temper, and often discourteous in manner, he paralyzes the voice of any one who has the temerity to differ in opinion with him. But to those who are willing to suppress their own opinions, to defer to him in everything, to say yes to everything that he says, even to take a scolding in silence and humility, if he happens to be in a scolding mood, he is kindness itself. He has many good qualities, he is generous to a fault to poor students in distress, enjoys a good laugh and a good story and therefore has many friends among those who have not had occasion to incur his displeasure. He is preeminently a Methodist preacher, a pulpit orator of great power, and pulpit orators always have their admirers who think that a great orator is necessarily a great man. It is a common saying that "you can get along with the chancellor if you know how to take him." The "knowing how" is to suppress one's individuality, never to offer one's own opinion, to flatter his vanity, and never under any circumstances to enter into a controversy or discussion with him. He never comes to a faculty meeting of the College of Applied Science except once a year, but he presides over the faculty of Liberal Arts and keeps it in a proper state of subservience and stagnation. One member of that faculty says: "No one ever dares express an original opinion in the faculty meeting for fear he will be snubbed by the chancellor." I have been thus treated by him in a meeting of the university senate, before I learned that the senate is not a deliberating and legislative body, as it appears to be, according to the charter, but a mere registering body, the chief duty of its members being, never to do anything but to vote "yes" on a few purely formal matters.

The chancellor's ideal of a university seems to be: the chancellor, a board of trustees who provide funds and approve of the chancellor's way of spending them; large grounds; numerous large buildings, the largest stadium in the country, the largest college gymnasium in the world, the largest college of liberal arts in the state; the most brawny athletes and the greatest number of victories in inter-university athletic contests; and for the future, more real estate, an agricultural college, an industrial college, an alumni hall, to contain an auditorium capable of seating 5,000 people, the largest college assembly hall in the country; a hundred thousand dollars to spend on beautifying the campus, and enough students, male and female, to make it from a real estate point of view, one of the four biggest universities in the country, the other three being Harvard, Chicago and Leland Stanford. And while these ideals are being realized, there is neglect of the intellectual growth of the university, and short-sighted parsimony as to the teaching force.

The end and aim of these ideals and these ambitions is the glorification of the chancellor. Like the King of France, who said, "l'etat c'est moi," and the Roman Emperor, who said, "See this great Rome which I have builded," the chancellor says, "See this great university which I have builded." "I am the university." When I suggested to the chancellor that it would be well to have a committee of the trustees investigate the condition and needs of our college he said, "No, I am the committee." So far is it true that he is the committee, that although there are sixty trustees, not one of them during the past five years has ever visited the college for the purpose of inquiry into its needs, its methods or its efficiency as an engineering college, nor has the dean ever been called on to make a report of its condition. The trustees have no intercourse whatever with the faculties, they have no committees on the colleges, nor even on buildings and grounds. They

leave everything to his autocracy, the chancellor. He is the committee, but one that is as dormant in regard to the College of Applied Science as the trustees themselves are.

There is another ideal of a university which Syracuse does not yet seem to have acquired. It is that it is a group of colleges, chiefly professional, each of which has a large degree of autonomy, and its business is not chiefly growth in real estate and in numbers of students, but first and foremost the giving of the best education possible to its undergraduates, by means of the best instructors and the most complete equipment that money can secure, and second, the advancement of knowledge by postgraduate work, fellowships in research, publication of researches, etc. Such a university has a democratic instead of an autocratic government, and a board of trustees, who, if they are not active in its affairs, at least to some extent are in touch with the faculties, giving them sympathetic encouragement. In such a university the alumni of each college are represented in the board of trustees and in the working committees, and they take an active interest in college affairs.

Syracuse University is not a sectarian institution in the sense that the doctrines of any religious sect are especially taught therein. Nevertheless, it may be properly called a Methodist institution inasmuch as it is completely under the control of the Methodist church and was organized by the Methodists.

According to the charter there are to be not less than 20, nor more than 60 trustees. The by-laws prescribe that each of eight Methodist conferences, in New York and New Jersey, shall elect four trustees residing within its bounds, which make 32, a majority of 60. This majority insures the Methodist conferences having absolute control of the university whenever they desire to exercise it. Of the 28 remaining trustees one is Chancellor Day, a Methodist minister, and the catalogue shows three other Methodist ministers, two of them, however, deceased. Of these 28 trustees six are alumni trustees, being elected by the alumni association of the university. Two of them, however, are salaried officers of the university, namely, the treasurer and the dean of the medical college.

Let us see how the Methodist church exercises its power of control over the university. It elects the chancellor, whose first qualification seems to be that he shall be a Methodist minister. This is not for the reason that a minister is any better qualified for such a position than a business or professional man would be, or than a professional educator, but that he may properly represent the Methodist denomination.

The next qualification seems to be that the chancellor should be a strong man. Recently a trustee, also a Methodist minister, wrote to me and said: "I have long been a trustee and was connected with the university when the persecutions on the part of some professors led Chancellor Sims to think that he could not stand it any longer and in spite of our persuasion he resigned. He had the sympathy of the trustees in all that struggle and we felt very well satisfied that in Chancellor Day we secured a head to the institution who could not be driven away by hostile professors." In the same letter, while referring to the chancellor's demand for my removal by the trustees at their next meeting, he said: "The chancellor was appointed by the trustees as head of the institution, and while I do not know what they will do if the matter comes up, it is my opinion that they will stand by the chancellor and let anybody go who gives him trouble."

From the above it is evident that the trustees do not care to give themselves any trouble with the government of the university. It is not apparent that any attempt was made to discover the grievances of the professors against Chancellor Sims, which might have led to the alleged "persecutions." Neither was it a question whether Chancellor Sims was or was not a good administrator. He had the sympathy of the trustees right or wrong. The same is true of the present chancellor. He has been appointed by the trustees as head of the institution, and they will stand by him and let anybody go who gives him trouble, notwithstanding that the trouble may

have been of the chancellor's making. Neither does there seem to be any investigation as to the merits of any trouble which arises between the chancellor and those under him. The chancellor is to be supported regardless of the fact that injustice may be done thereby.

The conference members of the trustees forming a majority appear to have no duties except to attend meetings of the board twice a year. They listen to the chancellor's report, approve all his recommendations, eat a dinner and adjourn. The other trustees, the business men, are busily engaged with their own affairs and turn the whole administration of the university over to the chancellor. Vacancies in the board of trustees, other than the conference members, are filled by the chancellor nominating one of his personal friends to the position. This gives him practically unlimited power; the board of trustees being made up first of some of the chancellor's rich friends, and secondly, of the inactive conference trustees. The board allows him to do as he pleases and agrees to all his recommendations, even to mortgaging the university for $400,000 to obtain funds to build the largest college gymnasium in the world, and, if the ideas of the trustee quoted above are followed, to dismiss the head of one of his colleges without any investigation on the part of the trustees to discover whether the dismissed man is a suitable person for the position or not, and without giving him any opportunity to present his side of the case.

The chancellor thus has unchecked power, which always tends to tyranny. The chancellor has, therefore, become a czar.

The conference trustees while they have it in their power to see that the university is provided with the best possible system of government, and while they have every opportunity to study by visiting other universities, what the best system of government is, have abdicated all their power and delivered it to a czar. Under such circumstances it can not be expected that the educational interests of the university can be well managed, any more than it can be believed that the governments of Russia and Turkey are the best governments under the sun. It is not to be expected that one man, however able he may be, possesses all the wisdom necessary to the proper outlining and developing of the many varied courses of a large university.

The remedy for this state of affairs is entirely within the control of the Methodist church. Controlling as it does the majority of the board of trustees, it can, if it so wills, give the university the best governmental system possible. Would it not be well for the Methodist General Conference to request its committee on education to study the subject and report to the several conferences which have jurisdiction of colleges, what should be the best system of administration in a university, in order to make it as efficient an educational institution as possible and be a credit to the Methodist denomination?

WILLIAM KENT,
Dean of the College of Applied Science
SYRACUSE UNIVERSITY

CONFERENCE ON CONSERVATION OF NATURAL RESOURCES

THE Conference of Governors on the Conservation of the Natural Resources of the country, held in the White House, May 13–16, proved a notable occasion. Except a few detained or called away by pressing state business, all the governors of the states and territories, including Hawaii and Porto Rico, took part, as did the governors' advisers, the justices of the Supreme Court, the members of the cabinet, the presidents of the leading scientific and technical organizations, and a few special guests, including Messrs. Andrew Carnegie, James J. Hill, W. J. Bryan and John Mitchell. President Roosevelt presided throughout two of the five sessions, and during a part of each of the other three. It was the consensus of opinion that the condition and probable duration of our leading resources were summarized more completely than ever before; and that the deliberations did more to emphasize the importance of research relating to the physical phenomena of the continent than those of any other earlier assemblage.

So far as the relations among the states and between these and the national government, are concerned, the general opinion expressed in public addresses and personal conversation was that the conference marked a new era, comparable only with that opened by the Philadelphia Conference in 1787, at which the constitution was framed.

Numerous resolutions were introduced, and were referred to a committee consisting of Governors Newton C. Blanchard, of Louisiana (chairman); John F. Fort, of New Jersey; J. O. Davidson, of Wisconsin; John C. Cutler, of Utah, and M. F. Ansel, of South Carolina; which committee, after weighing all the resolutions, expert statements, and other matter germane to the conference, framed and submitted a general declaration of principles which, after discussion, was unanimously adopted. While the value of any formal document necessarily falls below that of the consensus of opinion and feeling among the nation's executives, it may be regarded as the chief tangible result of the conference. It is as follows:

We, the governors of the states and territories of the United States of America, in conference assembled, do hereby declare the conviction that the great prosperity of our country rests upon the abundant resources of the land chosen by our forefathers for their homes, and where they laid the foundation of this great nation.

We look upon these resources as a heritage to be made use of in establishing and promoting the comfort, prosperity and happiness of the American people, but not to be wasted, deteriorated or needlessly destroyed.

We agree that our country's future is involved in this; that the great natural resources supply the material basis upon which our civilization must continue to depend, and upon which the perpetuity of the nation itself rests.

We agree, in the light of facts brought to our knowledge and from information received from sources which we can not doubt, that this material basis is threatened with exhaustion. Even as each succeeding generation from the birth of the nation has performed its part in promoting the progress and development of the Republic, so do we in this generation recognize it as a high duty to perform our part; and this duty in large degree lies in the adoption of measures for the conservation of the natural wealth of the country.

We declare our firm conviction that this conservation of our natural resources is a subject of transcendent importance, which should engage unremittingly the attention of the nation, the states, and the people in earnest cooperation. These natural resources include the land on which we live and which yields our food; the living waters which fertilize the soil, supply power and form great avenues of commerce; the forests which yield the materials for our homes, prevent erosion of the soil, and conserve the navigation and other uses of our streams; and the minerals which form the basis of our industrial life and supply us with heat, light and power.

We agree that the land should be so used that erosion and soil wash shall cease; that there should be reclamation of arid and semi-arid regions by means of irrigation and of swamp and overflowed regions by means of drainage; that the waters should be so conserved and used as to promote navigation, to enable the arid regions to be reclaimed by irrigation, and to develop power in the interests of the people; that the forests, which regulate our rivers, support our industries and promote the fertility and productiveness of the soil, should be preserved and perpetuated; that the minerals found so abundantly beneath the surface should be so used as to prolong their utility; that the beauty, healthfulness and habitability of our country should be preserved and increased; that the sources of national wealth exist for the benefit of all the people, and that monopoly thereof should not be tolerated.

We commend the wise forethought of the President in sounding the note of warning as to the waste and exhaustion of the natural resources of the country, and signify our high appreciation of his action in calling this conference to consider the same and to seek remedies therefor through cooperation of the nation and the states.

We agree that this cooperation should find expression in suitable action by the Congress within the limits of, and coextensive with, the national jurisdiction of the subject, and complementary thereto, by the legislatures of the several states within the limits of, and coextensive with, their jurisdiction.

We declare the conviction that in the use of the natural resources our independent states are interdependent and bound together by ties of mutual benefits, responsibilities and duties.

We agree in the wisdom of future conferences between the President, members of Congress and the governors of the states regarding the con-

servation of our natural resources, with the view of continued cooperation and action on the lines suggested. And to this end we advise that from time to time, as in his judgment may seem wise, the President call the governors of the states, members of Congress and others into conference.

We agree that further action is advisable to ascertain the present condition of our natural resources and to promote the conservation of the same. And to that end we recommend the appointment by each state of a commission on the conservation of natural resources, to cooperate with each other and with any similar commission on behalf of the federal government.

We urge the continuation and extension of forest policies adapted to secure the husbanding and renewal of our diminishing timber supply, the prevention of soil erosion, the protection of headwaters, and the maintenance of the purity and navigability of our streams. We recognize that the private ownership of forest lands entails responsibilities in the interests of all the people, and we favor the enactment of laws looking to the protection and replacement of privately owned forests.

We recognize in our waters a most valuable asset of the people of the United States, and we recommend the enactment of laws looking to the conservation of water resources for irrigation, water supply, power and navigation, to the end that navigable and source streams may be brought under complete control and fully utilized for every purpose. We especially urge on the federal Congress the immediate adoption of a wise, active and thorough waterway policy, providing for the prompt improvement of our streams and conservation of their watersheds required for the uses of commerce and the protection of the interests of our people.

We recommend the enactment of laws looking to the prevention of waste in the mining and extraction of coal, oil, gas and other minerals with a view to their wise conservation for the use of the people and to the protection of human life in the mines.

Let us conserve the foundations of our prosperity.

SCIENTIFIC NOTES AND NEWS

THE house of representatives concurring with the senate and by a unanimous vote, has granted an annuity for life of $125 a month to the widows of the late Major James Carroll, surgeon, U. S. army, and the late acting assistant surgeon, Jesse W. Lasear, whose lives were sacrificed in the study of yellow fever in Cuba.

PROFESSOR WILLIAM JAMES, who has been giving a course of lectures on philosophy at Oxford University, received there the degree of doctor of science on May 12.

DR. EDWARD S. MORSE has been elected a member of the Astronomical Society of Belgium.

MR. FRANCIS DARWIN, F.R.S., has been nominated the representative of Cambridge University at a meeting convened by the Linnean Society of London, to be held in July in celebration of the fiftieth anniversary of the reading of the joint essay by Charles Darwin and Alfred Russel Wallace "On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection."

MR. A. E. SHIPLEY, F.R.S., was elected president of the Association of Economic Biologists, which held its sixth annual meeting at University College, last month.

ON May 12 Professor F. T. Trouton began a course of two lectures at the Royal Institution on "Why Light is believed to be a Vibration" and "What it is which Vibrates." The Friday evening discourse on May 15 was delivered by Dr. H. T. Bulstrode on "The Past and Future of Tuberculosis," and on May 22 by Professor J. C. Kapteyn on "Recent Researches in the Structure of the Universe."

THE Croonian Lectures before the Royal College of Physicians, of London, will be delivered June 18 to 30, by Dr. A. E. Garrod, on "Inborn Errors in Metabolism."

THE German emperor has presented Professor Dörnfeld, head of the German Archeological Institute at Athens, with a sum of $1,000 for the purpose of starting excavations on the site of the ancient Pylos.

E. C. PARKER, assistant agriculturist at the Minnesota Experiment Station, will sail on June 30 to become expert adviser to the government officials of Manchuria. With W. H.

Tombave, now connected with the University of Pennsylvania, he will be employed in instituting modern methods of agriculture in Manchuria.

Mr. Roy C. Andrews, of the department of mammalogy of the American Museum of Natural History, has gone to Vancouver Island for the purpose of spending several months at the whaling stations on that coast. His work will be the securing of photographs, notes and measurements, which will furnish the data for a preliminary study of the Pacific species of whales.

Mr. V. Stefansson, the ethnologist, who spent the winter of 1906–7 among Esquimaux in the region of the delta of the Mackenzie River, is preparing to start for the mouth of the Coppermine River, about 460 miles east of the Mackenzie, to spend another year among the natives.

Mr. C. G. Abbot, director of the Smithsonian Astrophysical Observatory, has left Washington for Mt. Wilson, near Pasadena, California, where he will continue observations, conducted for a number of years both in Washington and in California, on the amount of heat received on earth from the sun.

Professor George P. Merrill, head of the department of geology of the United States National Museum, has gone to Coone Butte, Arizona, to be present at a number of deep borings to be made in the so-called Canyon Diablo crater, the cause of which has been a puzzle to geologists ever since it was brought to their attention. This crater-form depression in the desert is nearly three quarters of a mile across and about six hundred feet deep. Some men of science have believed it to be an extinct volcano and others, to be the record of the impact of a huge meteor which struck the earth centuries ago. Professor Merrill made a study of the depression last year, and in drawing conclusions upon the evidence brought back, he stated: "This, of course, absolutely precludes the formation of the crater by any deep-seated agency, and I have been forced to consider an origin by impact of a stellar body." The present borings in search of a buried meteor or meteoric irons and other phenomena may furnish additional material to account for its origin.

The Magnetic Survey yacht *Galilee*, chartered by the Carnegie Institution of Washington and under the command of W. J. Peters, returned to her home port, San Francisco, on May 22, after an absence of nearly three years. The total length of the cruises traversed in the Pacific Ocean during this period is about 65,000 miles. This closes the ocean magnetic work for the present until the construction of a vessel specially adapted for the work has been completed. Plans for the new vessel are now being prepared by Henry J. Gielow, naval architect and engineer.

Dr. W. J. Holland, the director of the Carnegie Museum, has completed the installation of the cast of the *Diplodocus* presented by Mr. Andrew Carnegie to the German emperor. It stands in the Lichthof of the Zoological Museum at Berlin and occupies the entire west side of the great room. On May 15 Dr. Holland went to Paris to install a similar replica in the National Museum in the Jardin des Plantes. While in Berlin Dr. Holland attended the sessions of the International Anatomical Congress. On May 5 he addressed a meeting of the *Gesellschaft Naturforschenden Freunde zu Berlin* and on May 13 a dinner in his honor was given, at which the cultusminister and the heads of all the departments of the university and of the various learned societies in Germany were present by invitation.

We learn from *Nature* that the president of the Board of Trade has appointed a committee to prepare a program for the consideration of the delegates to the International Conference on Electrical Units and Standards to be held in London in the ensuing autumn, and to make arrangements for the reception and assembly of the delegates attending the conference. The members of the committee are Mr. G. R. Askwith, K.C.; Sir John Gavey, C.B.; Dr. R. T. Glazebrook, F.R.S.; Major P. A. MacMahon, F.R.S.; Major W. A. J. O'Meara, R.E., and Mr. A. P.

Trotter. Mr. M. J. Collins, of the Board of Trade, will act as secretary to the committee.

THE members of the committee appointed to arrange for Germany's participation in the International Congress on Tuberculosis that is to meet in Washington next September include Victor, Prince of Hohenlohe and Count von Lerchenfeld; Baron von Knesebeck; Dr. Abb, secretary of the civil cabinet of the emperor at Berlin; Dr. Bumm, president of the Imperial Board of Health, and Professor Dr. Schjerring, general chief of the army sanitary corps. Dr. von Bethmann-Hollweg, the president of the committee, is the imperial secretary of the interior. Ernst von Mendelssohn Bartholdy, of the banking house of that name, and a member of the Prussian Diet, is the treasurer. Besides the members of official rank the list contains the names of many eminent men of science, including those of Dr. Robert Koch and Professor von Behring.

THE tablet in honor of Dr. Horace Wells, discoveror of anesthesia, which was sent to this country from Madrid by the Spanish Odontological Society, has reached Hartford by way of the Spanish minister at Washington. The memorial is composed of a silver plate surrounded by a wreath of white metal showing laurel leaves on one side and the oak on the other, with laurel berries in white and acorns in gilt. Above the plate is an ancient lamp with its light burning. The tablet is thirty-three inches by two feet. It bears the following inscription: "The Spanish Odontological Society to Horace Wells. Madrid, January 14, 1907."

WE learn with regret of the death of Dr. Heinrich Maschke, professor of mathematics in the University of Chicago, at the age of fifty-five years.

M. ALBERT DE LAPPARENT, the eminent French geologist, has died at the age of sixty-seven years.

WE regret also to record the death of Dr. K. Möbius, professor of zoology at Berlin, at the age of eighty-three years.

THE U. S. Civil Service Commission announces an examination on June 17 to fill two, and possibly three, vacancies in the position of medical interne (male) and one vacancy in the position of medical interne (female), at $600 per annum each, with maintenance, in the Government Hospital for the Insane, Washington, D. C., and vacancies requiring similar qualifications as they may occur.

TABLES at the laboratory of the United States Bureau of Fisheries, at Beaufort, North Carolina, will be available for the use of investigators after July 1. Requests for further information should be addressed either to the Commissioner of Fisheries, Washington, D. C., or to the director of the laboratory, Beaufort.

THE public opening of the Museum of the Staten Island Association of Arts and Sciences at the Borough Hall, St. George, Borough of Richmond, took place on Saturday afternoon, May 23.

THE provision of a Pasteur Institute for Burma is said to be now assured, though some little time must elapse before the work can be started.

WE learn from the *Journal* of the American Museum of Natural History that the museum has secured as a loan exhibit the series of eight paintings of Mt. Pelé, Martinique, made by the late Professor Angelo Heilprin of the Philadelphia Academy of Natural Sciences and Yale University. Professor Heilprin visited Martinique during the eruptions of 1902 and 1903, first as the delegate of the National Geographic Society and afterwards on his own account. The paintings now at the museum were made from sketches, photographs and other studies in the field and are valuable not only from an artistic point of view, but also from their giving a record of the impressions of an observer who was a scientist as well as an artist. The paintings have been installed in the lobby of the central hall of the second floor.

UNIVERSITY AND EDUCATIONAL NEWS

THE public bequests announced under the will of the late Mr. T. Webb include £5,000

to University College, London, to be used and applied, so far as is practicable, for the purposes of physical research, and £5,000 to University College of South Wales and Monmouthshire, also for physical research.

The London *Times* states that the new university established by the legislature of Alberta will open its first term next September. The site for its buildings is a fine one of 250 acres at Strathcona, on the Saskatchewan River, opposite Edmonton, the provincial capital. The plans have not yet been prepared; and, meanwhile, the university will have the use of a large school building in Edmonton. The scheme of the university's work and buildings is comprehensive; but in the first term there will only be one combined faculty, of arts and science, giving B.A. and B.Sc. degrees. Dr. H. M. Tory, the president, formerly professor at McGill University, says he expects to begin with 40 or 50 students. The province has set apart for the revenue of the university one fifth of the educational land tax and one fifth also of the tax on joint stock companies; and the legislature will make special grants for building. The convocation consists of the university graduates resident in Alberta, numbering 364, about half of whom are alumni of Toronto University. This body of graduates also elects five of the fifteen members of the senate.

We learn from the New York *Evening Post* that the construction of the building to be used by the geology department of Williams College is progressing rapidly. The exterior will be of red brick, painted a colonial yellow to match West College, and the trimmings will be of white marble. There will be two stories and a basement. Lecture rooms, laboratory, library and workshop will be in the basement. A museum will occupy the whole of the first floor, and around the walls will be placed fragments of old Clark Hall. The building should be ready for occupancy at the beginning of the next college year.

The Summer School of The Connecticut Agricultural College, which holds its seventh annual session July 1 to 24 inclusive, has arranged for special courses in nature study, pedagogy, and elementary agriculture. The Summer School is planned to meet the needs of teachers and others who wish to learn something about outdoor life.

The trustees of the George Washington University have adopted a recommendation that no student will be hereafter matriculated in the Department of Medicine who can not give his full time to study. The work will begin at nine o'clock in the morning and continue throughout the day, the evening work being discontinued except so far as is necessary to provide for students already in the school. This action puts all the work of the university in the day time.

The numbers of medical students in German universities during the summer course of 1907 were as follows: Münich, 1,248; Berlin, 876; Freiburg, 645; Leipzig, 498; Würzburg, 449; Heidelberg, 397; Kiel, 340; Marburg, 291; Bonn, 277; Breslau, 277; Jena, 275; Tübingen, 242; Strassburg, 233; Königsberg, 216; Halle, 210; Greifswald, 201; Erlangen, 199; Göttingen, 176; Giessen, 173; Rostock, 122. Total, 7,345.

At Yale University Dr. Henry Lord Wheeler, '90 S., has been promoted to be professor of organic chemistry in the Sheffield Scientific School, and Dr. Joseph Barrell, '00 Ph.D., to be professor of geology in the college. New appointments and promotions were: Ernest Wilson Sheldon, '07, and Horace T. Burgess, '06, to be instructors in mathematics; Clarence Curtiss Perry, '04 S., from assistant to be instructor in physics and steam engine; Clifford Whitman Bates, '05 S., and Charlton Dows Cooksey, '05 S., from assistants to be instructors in physics.

Dr. Wm. M. Wheeler, curator of invertebrate zoology in the American Museum of Natural History, has been appointed professor of economic entomology in the Graduate School of Applied Science of Harvard University.

Errata: In the article on "Geological Climates" by Dr. J. M. Schaeberle in the issue of Science for May 18, on page 784, last line of first paragraph, second column, for "that" read "than," and on page 785, first column, tenth line of first paragraph, for "other" read "ether."

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

PRELIMINARY ANNOUNCEMENT OF THE SPECIAL SUMMER MEETING TO BE HELD AT HANOVER, NEW HAMPSHIRE, JUNE 29–JULY 3, 1908, AND OF THE AFFILIATED SCIENTIFIC SOCIETIES THAT WILL MEET AT THE SAME TIME AND PLACE

GENERAL ANNOUNCEMENT

A SPECIAL summer meeting of the American Association for the Advancement of Science will be held at Hanover, New Hampshire, from June 29 to July 3, 1908, in the buildings of Dartmouth College.

At this meeting, Sections A, C, D, F, G, H and K will probably hold no sessions. Section B will meet in conjunction with the American Physical Society. Section E will meet in conjunction with the Geological Society of America. Section L will hold a symposium on a subject to be announced later. Section I may also hold a symposium. Detailed information is given below.

For matters relating to local arrangements not given in this announcement, members should address Professor H. H. Horne, Dartmouth College, Hanover, N. H.

For information relating to the presentation of papers, members should address the secretaries of the respective sections, or they may write to the permanent secretary who will promptly forward to the proper officer. Titles and abstracts of papers should be sent promptly to the secretaries of sections or the permanent secretary, as it is desired to put the program in the hands of the printers about June 26. The post-office addresses of the secretaries of the sections which will meet at Hanover are as follows:

Section B—A. D. Cole, Vassar College, Poughkeepsie, N. Y.

Section E—F. P. Gulliver, Norwich, Conn.

Section I—J. Pease Norton, Yale University, New Haven, Conn.

Section L—C. R. Mann, University of Chicago, Chicago, Ill.

The entire program of the meeting will be published immediately in advance of the opening date.

Please try to secure at least one new member.

Members who have not already paid their dues for 1908 should forward them before the meeting to the permanent secretary. *Members should not forget to bring their numbered tickets (if they have already paid their annual dues).*

The permanent secretary will be at his Washington address until June 26; after that date he should be addressed at Hanover Inn, Hanover, New Hampshire.

The register for the Hanover meeting will open at 10 o'clock A.M., on Monday, June 29, in College Hall.

LOCAL COMMITTEE OF THE HANOVER MEETING

The names of the full committee will be published in the regular program. The following are the officers and chairmen:

Honorary Presidents—William Jewett Tucker and John King Lord.

Chairman—Robert Fletcher.

Secretary—Herman Harrell Horne.

Committee on Transportation, Hotel and Accommodations—Chairman: Ernest Martin Hopkins.

Committee on Excursions—Chairman: Charles Henry Hitchcock.

Committee on Membership—Chairman: Charles Henry Hitchcock.

Committee on Finance—Chairman: Charles Parker Chase.

Committee on Places of Meeting—Chairman: Charles F. Emerson.

Committee on Entertainment of Visiting Ladies—Chairman: Mrs. Wm. Patten.

HEADQUARTERS AND ACCOMMODATIONS

The official headquarters and social rendezvous will be in *College Hall*, where convenient and ample rooms are available for the registration office and transaction of all business, and for social gatherings. The large parlor or lounging room is especially suitable for small gatherings of groups of members, a common meeting place where "appointments" may be made, etc.

Room accommodations will be provided in College Hall or in one or more of the dormitories—Massachusetts, Wheeler, the Fayerweathers—at the uniform price of one dollar per day. These are all new buildings with modern appointments.

Meals will be furnished, à la carte, in the large dining room of College Hall—capacity 500—under

management of the Dartmouth Dining Association —Arthur P. Fairfield, comptroller.

All communications concerning rooms and meals should be addressed to Arthur P. Fairfield, manager of the Hanover Inn.

A limited number of rooms with board, American plan, may be available at the Hanover Inn. Rates $2.50 to $4.00 per day, according to size and location of room, and whether without or with bath. Single meals: breakfast and dinner, 75 cents; luncheon, 50 cents.

PLACES OF MEETING

Places of meeting will be announced in the program, which will be published on June 29. All are within three minutes' walk of College Hall.

ANNOUNCEMENT OF THE LOCAL COMMITTEE

The meeting of the American Association for the Advancement of Science is to be held at Hanover, N. H., from June 29 to July 3, on the invitation of Dartmouth College. The Trustees of Dartmouth College have put the buildings of the college at the disposal of the association for this meeting. The administration has authorized the use of College Hall and the facilities at command of the Dartmouth Dining Association for use as general headquarters, for lodgings for the visitors, and for service of meals in the large dining hall (if need be), which will accommodate as many as five hundred. As many of the dormitories as may be needed will also be opened—affording pleasant, comfortable and convenient rooms. Commodious lecture rooms for general meetings and for meetings of sections (with ample lantern facilities), and smaller rooms for smaller groups of members, are available in Dartmouth, Wilder and Chandler Halls and in the Tuck building. All of these accommodations are within three or four minutes' walk of College Hall.

Mail may be sent to the *post-office*, general delivery, which is within two minutes' walk of College Hall.

LOCATION AND ACCESSIBILITY OF HANOVER

The railroad station, about five eighths of a mile from the Hanover Inn and post-office, is known as Norwich and Hanover, on the Passumpsic Division of the Boston and Maine Railroad. White River Junction, four miles south of Hanover, is the center of four lines of railroad: The Concord Division of the Boston and Maine system; the Central Vermont Railroad and the Connecticut River Division, Boston and Maine Railroad (eight hours to New York), and also connecting at Greenfield and Springfield (Boston and Albany Railroad) for the west; the Central Vermont Railroad, making connection with Montpelier, Burlington and the west (thirty hours to Chicago); the Passumpsic Division, Boston and Maine Railroad (eight hours to Montreal).

Trains leave Boston at 9:00 and 11:30 A.M. and at 3:44 and 7:30 P.M.; due at Norwich and Hanover at 1:56, 4:50 and 9:30 P.M. (at White River Junction), and at 1:02 A.M. (excepting Mondays). *There may be changes in this schedule June 29.* Sunday trains from Boston, 11:30 A.M. and 7:30 P.M, Distance, 150 miles.

From New York the most convenient train is the White Mountains Express, which has heretofore left Grand Central Station at 8:45 A.M. It is a through train—no change of cars—due at Norwich and Hanover about 4:25 P.M. Other New York trains are one at 12:00 noon and one at 4:00 P.M.—the latter on Sundays, also. In the summer season there has been also a night express for summer-resort people. The noon train is due at White River Junction at 8:05 P.M. and the next later train at 12:20 A.M.; the night train comes through to Norwich and Hanover except on Mondays. Distance, 264 miles; fare, $5.85.

In case one fails to make immediate connection at White River Junction with trains on the Passumpsic Division, teams can be procured at the Junction House, for the ride of four and a half miles; charge, one dollar and a quarter.

A train leaves Springfield, Mass., at 9:10 A.M., due at Norwich and Hanover at 1:56 P.M.; distance, 129 miles. Trains from the west connect with the Connecticut River trains, more or less directly, at Springfield, Greenfield and White River Junction. Generally, the connections are not close with trains going north.

The village of Hanover is situated on a plain 170 feet above Connecticut River, elevation above mean sea level from 525 to 550 feet. There are points of interest in various directions, reached by pleasant drives, for which carriage hire is moderate in comparison with prices in or near large cities. The mills of the International Paper Company at Wilder, two miles below, are operated by a large development of water-power. The copper mines of Ely and Strafford, Vt., are distant, respectively, 13 and 20 miles. One of the finest mountain views in the state is to be had from Cardigan Mountain (altitude, about 3,000 feet), reached by an easy excursion requiring one day for the trip; a road leads to within but little more than a mile from the summit, and the remaining ascent is not difficult.

The Country Club offers to visiting members

free use of the golf links and tennis courts. The grounds are within seven minutes' walk of College Hall.

The Blue Mountain Forest Park, to which it is proposed to make an excursion, was planned, purchased and stocked by the late Mr. Austin Corbin, who was a pioneer in the modern endeavor to rescue and perpetuate some of the larger animal life of the American wilderness, now so nearly extinct. It covers above 35 square miles, including Grantham Mountain and Buffalo Mountain, and contains the famous herds of buffalo, moose, elk and mountain goats, as well as boars and smaller game. Mr. Austin Corbin, president of the Blue Mountain Forest Association, has extended a cordial invitation to the American Association for the Advancement of Science to visit the forest. The most convenient access to the park is from Newport, N. H., reached from Hanover by rail. A special train is to be provided for this occasion, if the attendance will warrant. On the return from the park, excellent accommodations are available at the Newport House, just remodeled and enlarged.

RAILROAD RATES

A railroad rate of one fare and one third for the round trip, on the certificate plan, has been granted by the Trunk Line Association (excepting the New York, Ontario and Western R. R. and the Chesapeake and Ohio R. R.), the New England Passenger Association (excepting the Bangor and Aroostook R. R.) and the Eastern Canadian Passenger Association.

The same rate has been requested of the Central, the Southeastern and the Southwestern associations, but no assurance can be given of its being granted.

The Western Passenger Association has on sale revised one-way fares in effect to Chicago, Peoria and St. Louis, with the understanding that persons can repurchase from these points and take advantage of any reduced fares that may be authorized therefrom. The fares to Chicago, Peoria and St. Louis from a large part of the Western Passenger Association territory are now on the basis of two cents per mile; hence, with the reduced fares from the three cities named, the net rate amounts practically to a fare and one third rate. Summer tourist tickets will be on sale to Chicago and St. Louis from June 1 to September 30, inclusive, with return limit of October 31, 1908, from a large number of points in Western Passenger Association territory, at fares of less than two cents per mile, of which advantage can be taken.

The Transcontinental Passenger Association has on sale daily from Pacific Coast points regular nine months' tourist tickets to Chicago, St. Louis, Memphis and New Orleans, at rates which approximate one fare and one third for the round trip.

The following directions are submitted for your guidance:

1. Tickets at full fare for the *going* journey may be secured within three days prior to, and during the first three days of the meeting. The advertised dates of the meeting are June 29 to July 4, 1908; consequently, you can obtain your tickets not earlier than June 25, nor later than July 1.

From points located at a great distance, from which it takes more than three days to reach Hanover, going tickets may be purchased on a date which will permit members to reach Hanover by June 29.

2. Present yourself at the railroad station for ticket and certificate at least thirty minutes before departure of the train.

3. Certificates are not kept at all stations. If you inquire at your station you will find out whether certificates and through tickets can be obtained to the place of meeting.

4. On your arrival at the meeting, present your certificate to Mr. F. S. Hazard, assistant secretary. It has been arranged that the special agent of the Trunk Line Association will be in attendance at the office of the permanent secretary, to validate certificates, on June 30 and July 2.

5. In order to prevent dissatisfaction, it must be understood that the reduction on the return journey is not guaranteed—but is contingent on an attendance of not less than 100 persons via all lines, all told, obtaining from agents at starting points certificates showing payment of full first-class fare of not less than seventy-five cents (75c.) on going journey.

If the necessary minimum is in attendance, and your certificate is duly validated, you will be entitled, up to and including July 7, 1908, to a continuous passage ticket to your destination via the route over which you made the going journey, at one third the limited fare.

PRELIMINARY PROGRAM

Monday, June 29

10:00 A.M.—The register for the Hanover meeting will be open at the office of the Permanent Secretary in College Hall.

12:00 M.—The regular meeting of the Executive Committee in College Hall.

8:00 P.M.—First general session of the association in Lecture room A, Dartmouth Hall.

The meeting will be called to order by the president of the association, Dr. T. C. Chamberlin.

An address of welcome will be given by Acting-president Dr. John King Lord (in the necessary absence of President William J. Tucker), speaking in behalf of the board of trustees of Dartmouth College.

President Chamberlin will respond to the welcome on behalf of the association and visiting societies.

Announcements will be made by the general and local secretaries and the meeting will be declared formally opened. At the conclusion of these exercises, an informal reception will be held by the local committee.

Tuesday, June 30

9:00 A.M.—Meeting of the Council in College Hall.

10:00 A.M. and 2:00 P.M.—Meetings of the sections for the reading of papers.

8:00 P.M.—Public lecture, complimentary to the citizens of Hanover, by Professor J. W. Spencer. Title: "The Spoliation of Niagara."

Wednesday, July 1

9:00 A.M.—Meeting of the Council in College Hall.

10:00 A.M. and 2:00 P.M.—Meetings of the sections for the reading of papers.

2:00 P.M.—Symposium under the auspices of Section L.

8:00 P.M.—Lecture. (Speaker to be announced.) Subject: "The American Bison."

Thursday, July 2

Excursion to Corbin Park. (Details to be announced.)

EXCURSIONS UNDER THE AUSPICES OF SECTION E

Section E, Geology and Geography, proposes to give a series of excursions to various points in Vermont and New Hampshire in connection with the meeting of the American Association for the Advancement of Science at Hanover this summer.

A tentative plan is the following:

1. The first excursion to be made under Dr. Wolff, of Harvard University, starting from Bellows Falls, Vermont, Friday, June 26. This will be a trip across the Green Mountains, arriving at Rutland, Vermont, some time on Saturday.

2. An excursion with Professor Perkins, state geologist of Vermont, to some of the marble quarries.

3. An excursion to Ascutney Mountain, Vermont, under Dr. R. A. Daly.

4. A trip to the Quechee River local glacier, under Professor Hitchcock, of Dartmouth.

5. A study of the terraces of the Connecticut River.

6. A day in the Corbin Park to see the buffalos, etc.

7. A trip of one to three days around Littleton, New Hampshire.

8. A trip to Mount Monadnock, if enough care to go.

9. A trip to one of the points of interest for economic geology.

10. The final excursion will be made to the Summit House on Mount Washington, where greatly reduced rates have been secured for a stay of from a day to a week.

It will greatly assist in making arrangements for the meeting if all those who have any thought of taking part in these excursions will send word as soon as possible to

F. P. GULLIVER,
Secretary Section E
30 HUNTINGTON LANE,
NORWICH, CONN.

AFFILIATED SOCIETIES

The American Physical Society and the Geological Society of America have signified their intention to meet at Hanover in affiliation with the American Association for the Advancement of Science.

All members of the American Physical Society and the Geological Society of America, who are not members of the American Association for the Advancement of Science, are earnestly requested to register at the desk provided for the purpose in the office of the permanent secretary, College Hall, so that an approximate record may be made of the total number of scientific men in attendance at the Hanover meeting.

SPECIAL NOTICE

Abstracts of papers intended for presentation should be sent to the permanent secretary or to the secretary of the section concerned.

Each member is requested to send to the permanent secretary the nomination of at least one new member whose election would add to the strength of the association.

L. O. HOWARD,
Permanent Secretary
SMITHSONIAN INSTITUTION,
WASHINGTON, D. C.